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BONE INFECTION

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I. THE HABITAT OF MOUTH INFECTION

IT is widely recognized that the resorption of bone from the alveolar crests in pyorrhea or from the region around the apex of a pulpless tooth is due to infection, but it is not true that there are any infecting organisms actually present in this resorbing bone or that there ever have been. The germs themselves are confined either to the débris of the pocket or to the necrotic contents of the root canal. Only the soluble poisonous products of their activity invade the living tissues.

In this distinction lies a very important difference, which, if it can be upheld, will not only profoundly modify our approach in treating mouth infections, but will also modify bacteriologic practice and affect the attitude of general medicine toward focal infection.

Many attempts have been made to demonstrate the presence of organisms both in resorbing bone and in the soft tissues surrounding the infected root canal or pyorrhea pocket; but though organisms could regularly be cultivated from extracted vital teeth, which suggested their presence in these tissues, any attempt to demonstrate them histologically in postmortem material among the normal cells was at best only rarely successful, and then merely to the extent of demonstrating the presence of a stray organism due to contamination or accident. The tissues, despite their abnormal radiologic appearance and the heavy round-cell infiltration, consistently failed to show the presence of organisms when examined under the microscope.

Nevertheless, almost every tooth extracted from a pyorrheic mouth, whether its pulp was alive or dead, continued to provide a massive growth of organisms from its apex, and even from inside the pulp chamber on routine culture; and the suggestion that these organisms were living in the surrounding tissues seemed irresistible. It can, however, be shown that this is not the case, and that these

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Fig. 1.—Photomicrograph (retouched) of section from case of human pyorrhea. F, zone of infection (débris, organisms and polymorphonuclear leukocytes in pocket). R, zone of contamination (round cells) stretching out along line of vessels (V). The bone (B) and the periodontal fibers (P) are alternately resorbed and rebuilt as the toxic tide ebbs and flows. The cementum and dentin (D) had undergone a similar process of resorption and repair at an earlier stage in the disease. (× 85.)

chronically inflamed tissues are in fact always sterile, as the histologic search indicates.

The discovery of this fact indeed arose out of further consideration of the histologic picture in pyorrhea. The suggestion that the heavy round-cell infiltration of the tissues indicated the presence of infection was at first attractive, but, on mature consideration, was unconvincing, inasmuch as the round cells, most of which are lymphocytes, are not in any way capable of dealing with a streptococcus, and so are not likely to go near one. It is the polymorphonuclear leukocyte which is always found in great numbers at an actual site of infection, avidly engulfing the streptococci in its cytoplasm, and these cells are conspicuously absent in chronically inflamed tissues (Fig. 1).

The round cell, which is composed almost entirely of nucleus, has not sufficient cytoplasm to send out a pseudopodium and surround an organism, and it does not live by phagocytosis. The polymorphonuclear leukocyte, however, like the ameba, is accustomed to feed on solid particles; in fact, its normal food is the débris of the red blood cells as they disintegrate. It is so attracted by the streptococcus that it always swarms round any point of infection where these organisms abound, and may even be found outside the body actually crawling about in the débris of a pyorrhea pocket in search of food, or in the necrotic material which forms the pus of a boil or acne pustule.

The lymphocyte, which is the cell found infiltrating the parodontal tissues in chronic inflammation, whether due to

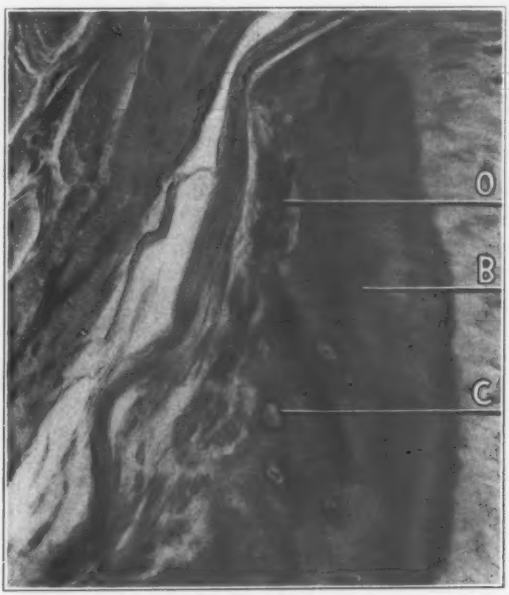

Fig. 2.—Photomicrograph of alveolar crest in case of human pyorrhea. The osteoclasts (O) were actually caught absorbing the bone (B). The empty lacunae (C) on the resorbing side indicate that the osteocytes are dead and the bone is therefore contaminated. (×460.)

pyorrhea or apical infection, has an entirely different method of feeding. Unable to engulf solid particles, it obtains its nourishment by absorbing soluble matter in liquid form from its environment. Nevertheless, just as the actual polymorphonuclear leukocyte is particularly attracted by the streptococcus although its normal food is erythrocyte débris, so is the lymphocyte attracted by the soluble toxic products of the streptococcus, though its normal food is more often sought in the liquid drainage from the cells which filters through the lymphatic glands.

The lack of cytoplasm in the round cell, moreover, enables the lymphocyte to crawl but slowly through the tissues. However, this is also an adaptation to environment and suits its purpose very well, for as it approaches a site of infection, it has already dropped behind the more active polymorphonuclear leukocyte. The round cell reaches a point where the soluble products of the organisms and the breakdown products of those cells which are killed by the infection are diffusing into the surrounding living tissues, and goes no farther, since this is the material to which it is attracted.

We thus find around the apical canals of a pulpless tooth or around a pyorrhea pocket (Fig. 1) a cordon of polymorphonuclear leukocytes actually in contact with the organisms, even creeping out into the pus and débris of the pocket or trying to squeeze into a root canal to get at the organisms. (Compare Fig. 5.) Then behind these active phagocytes are seen the less enterprising lymphocytes, diminishing in number as the concentration of toxic matter diminishes farther from the actual site of infection.

It is just because the polymorphonuclear leukocyte is so keenly attracted by the streptococcus and because Nature always throws up such a magnificent and spectacular barrier when infection is actually present that it seemed impossible for germs to be calmly living among ordinary cells, with no special attention paid to them beyond the attraction of a few round cells. One might as well expect to see a crowd of small boys take no notice when, for instance, a number of golf balls was thrown among them. Some of the balls might hit them, but all would be welcome and rapidly absorbed, unless an odd one rolled into an inaccessible corner.

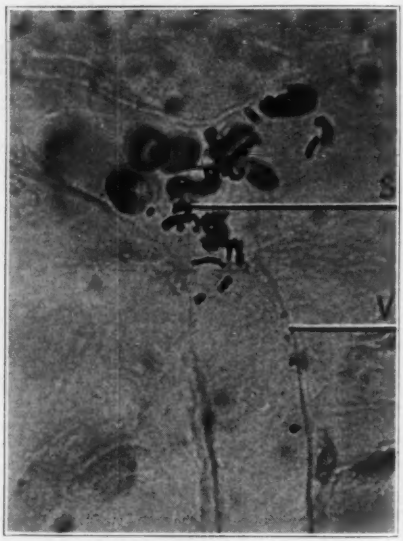

Fig. 3.—Photomicrograph of section of normal pulp of extracted human tooth. Streptococci (S) had been carried into the vessel (V) during extraction. (From Brit. D. J., Vol. 61, 1936, p. 336.) (× 1,125.)

The introduction of a few streptococci into the tissues will, as I hope to show, create just the same sort of interest. Polymorphonuclear leukocytes arrive from all quarters and rapidly absorb them, unless they grow in some inaccessible crevice (Figs. 5-6).

Not only is it unlikely that streptococci are present in the parodontal tissues and

Fig. 4.—Photomicrograph of guinea-pig mandible artificially infected (F) seven days before. The organisms are confined to the zone of infection (centered at F) by polymorphonuclear leukocytes. Their poisons diffuse into the tissues and C is the center of the zone of contamination (round cells and histiocytes). Farther away, in the region (R) where the toxic matter is more dilute, the zone of irritation is marked by osteoclasts and histiocytes; while farther still, the zone of stimulation (S) shows active bone and collagen fiber construction by osteoblasts and fibroblasts. (× 55.)

are completely overlooked by these vigilant phagocytes, but also it is difficult to imagine how a non-motile organism such as the streptococcus could get into the tissues. We know that the germs are present in the débris of a pocket, but so are the leukocytes, and the very dense cluster of polymorphonuclear leukocytes which form the floor of a pyorrheic ulcer are all trying to get to the surface and secure a streptococcus. It is impossible to believe that one of these immobile vegetable organisms could force its way through this cordon of highly motile leukocytes to which it represents a very attractive form of food. Much less could the organism multiply and grow through this formidable array by peaceful penetration without being consumed.

When, however, bacteriologists actually succeeded in cultivating organisms from the pulps of teeth which appeared both clinically and histologically normal, to which not a single lymphocyte, let alone a leukocyte, had been attracted, it was clear that something more substantial than the evidence of histologic interpretation was needed to clarify the position.

Fig. 5.—Photomicrograph of zone of infection, showing staphylococci (S) flourishing in accidental clefts of bone caused by bur; and polymorphonuclear leukocytes (L) seeking them out. (van Gieson stain; × 1,000.)

Indeed, if it had been found possible to prove that both the histologic and the bacteriologic findings were a true representation of the case and that organisms could live in tissues which appeared histologically normal, the foundations on which histopathology is built would have crumbled away and experimental pathology would have been thrown into complete confusion. Fortunately, the fallacy was discovered, and a very simple test is available.

The first indication of a solution of the problem was given by Okell and Elliott,[1] of University College Hospital, London, who recovered mouth organisms from blood taken from the median basilic vein five minutes after pyorrheic teeth had been extracted. They showed that the blood was sterile before the extractions and was sterile again very soon after; but it was clear that the act of extraction produced a transient bacteriemia by disturbing mouth organisms and setting them free in the blood stream, where they remained for some minutes or hours, until they were eaten by phagocytes.

Fig. 6.—Photomicrograph of zone of infection, showing staphylococci (S) flourishing in the same accidental clefts of bone caused by bur. (Gram stain; × 1,000, for comparison with Fig. 5.)

Much was proved by the brilliant researches of Okell and Elliott, but there remained a most important question: From whence had these germs been set free? Naturally, the clinical bacteriologist who regularly finds mouth organisms on the apices of extracted teeth would say they had come from the periapical tissues; but we were so impressed by the histologic picture of normal healthy cells at the apex of a pyorrheic tooth that it seemed to us more likely that they had come from the débris in the pocket. Admittedly, it was going to be more difficult to explain how they did it; how, that is to say, they could be carried or pumped into the blood stream from the pocket by the act of extraction, but the evidence that this must occur was already strong, and it was quite easy to settle it definitely one way or the other.

If our view were correct, provided we sterilized the pocket before extraction, we should always get a sterile apex, a sterile pulp and sterile blood stream after extraction; but if we were wrong and if the organisms were indeed living freely among the cells in the periapical tissues and in the pulp, our sterilization of the pocket would make no difference and after extraction we should still find the apex and the pulp infected and the patient would have the usual transient bacteriemia which Okell and Elliott had discovered, and which we had ourselves confirmed.

It was a simple matter to pass a red hot cautery wire round the parodontal sulcus of a single-rooted pyorrheic tooth which had to be extracted, and kill every organism present. Then, provided the tooth came out easily so that there was no risk of accidental surface contamination, the sterility or otherwise of the pulp

and periapical tissues would be truly represented in the bacteriologic report on the extracted tooth.

This had frequently been attempted, but, in an excess of zeal, the investigators had used multirooted molars as well as single-rooted teeth, so that often the pocket had only been partially cauterized, as, for instance, when it ran between the roots, where it would obviously be inaccessible. To attempt to cauterize the pocket of such a tooth was a waste of time. Nevertheless, about 70 or 80 per cent of apices were reported sterile from the inclusion, in the series, of teeth which presented some difficulty in extraction. In such cases, a pool of blood wells up round the edge of the gum before the tooth gives way, and this blood becomes contaminated from the crowns of the surrounding teeth and finally is smeared over the root as it leaves the socket. Nevertheless, by cauterizing the pocket, workers were reducing the figure from practically 100 per cent of roots showing infection after extraction in pyorrheic teeth to about 20 per cent of all cases attempted.

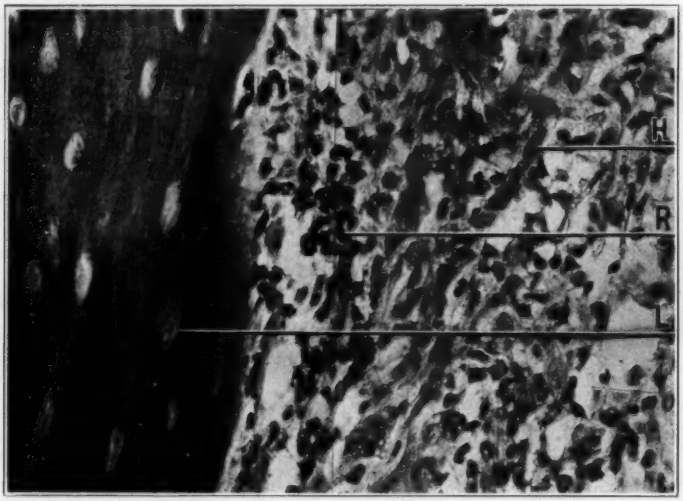

Fig. 7.—Photomicrograph of zone of contamination. The osteocytes have died in the bone lacunae (L) and there are none of the normal cells (fibroblasts and osteoblasts) left in the soft tissues which are infiltrated entirely by round cells (R) and a few phagocytic histiocytes (H). (× 450.)

by this method, an enormously higher percentage than when no attempt was made to sterilize the pocket; but to include the result of cultivating from the roots of these molars in an experiment designed to determine the habitat of oral infection was simply to confuse the issue.

A second source of contamination may well have arisen in these experiments

In our own experiments,[2] we restricted the cases to single-rooted teeth which could be extracted easily; and, when possible, we chose those which were isolated, by previous extraction, from their neighbors. On the other hand, we deliberately chose teeth which displayed an advanced stage of pyorrhea. We further excluded from the series and did not send for culture any tooth regarding

which we were in doubt as to whether we had reached the bottom of the pocket with the cautery wire, or extraction of which was difficult, with consequent bleeding and possible contamination. In this way, we obtained an unbroken series of thirty teeth giving negative results on culture of the apex and the pulp. These were all live teeth from pyorrhea cases in which the control teeth, extracted without prior sterilization of the pocket, were in each case positive. Moreover, in a number of these cases, we checked this result by showing that when the living teeth or in the blood stream after extraction came not from the parodontal tissues, but from the débris in the pocket.

A very interesting confirmation by actual visual demonstration became available, for when we cut sections of a control tooth which was extracted without any preliminary sterilization of the sulcus, we were able to show the organisms in the pulp under the microscope just as they had been found bacteriologically, but we saw quite easily that they were in the actual blood vessels of the pulp (Fig. 3). No one, of course,

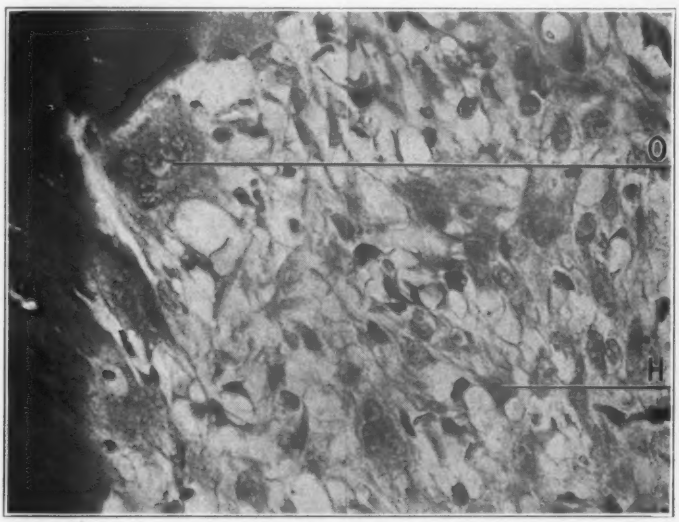

Fig. 8.—Photomicrograph of zone of irritation showing osteoclasts (O) digesting matrix, and numerous histiocytes (H) digesting intercellular collagen fibers. (× 450.)

pocket was sterilized, there was no bacteriemia following tooth extraction. We have since constantly repeated the experiment as a demonstration, and it has been verified by numerous colleagues, who have satisfied themselves of its accuracy and significance. This experiment, therefore, together with the findings of Okell and Elliott, showed conclusively, as we expected it would, that the organisms found at the apices and in the pulp of could suggest that these organisms were living permanently in the blood stream of the pulp unless the general blood stream was full of them, and this was certainly not the case. The mechanism by which they enter the blood stream from the pocket at the moment of extraction has been discussed elsewhere.[2]

Thus, it was established that the living tissues around the root of a tooth with pyorrhea, though chronically inflamed,

are sterile, and that organisms cultured from the apex of such a tooth or from the blood after its extraction have been pumped into the vessels of the periodontal membrane from the pocket in the preliminary stages of the operation.[2] It was even found that chewing a hard piece of toffee or candy would cause a transient bacteriemia in a patient who had marked pyorrhea.[3]

The inflammation of the parodontal tissues could, therefore, only be due to toxic matter from the pocket soaking into the tissues at points where the pocket epithelium was ulcerated, and the infiltration of the tissues by round cells, which is the cardinal sign of chronic inflammation, is due to the predilection of lymphocytes for this toxic material.

The next step was taken by J. W. Graham,[4] who showed that if the contents of pyorrheic pockets were collected and filtered free from organisms and solid débris, the sterile filtrate was so toxic that it caused fatty degeneration of the liver and even death in guinea-pigs and cats, when injected subcutaneously.

It therefore seemed not unlikely that the local breakdown of the fibrous attachment of the tooth and the resorption of the alveolar bone, which are such prominent features of pyorrhea, could, in some way, be accounted for in the light of this knowledge. The bone matrix and the fibrous strands of collagen which attach the tooth to the bone are both intercellular material. They are laid down by their guardian cells, osteoblasts and fibroblasts, but they are not themselves living cells. They are incapable of reproduction, interstitial growth or reaction to irritation, which are essential attributes of life. When they are contaminated therefore, as they are by these poisons soaking in, they are eaten away by phagocytic cells, osteoclasts or histiocytes, as the case may be, and might, under happier circumstances, have been replaced by the renewed activity of the appropriate constructive cells; but when, as in pyorrhea, the toxic contamination persists, instead of the matrix being replaced, more and more will be eaten away.

As the superficial periodontal fibers give way, the epithelium grows down to the point where the deeper ones remain embedded in the cementum. This, the so-called down growth of epithelium, is, of course, just the usual tendency of epithelium to cover a breach in the surface. As the bone is resorbed, the socket widens and the tooth loosens.*

These are the ordinary happenings observed under the microscope in any case of pyorrhea, but it is very easy to show that they are also the common response of connective tissue to contamination by the toxic products of microorganisms under any other circumstances. It is possible, by implanting streptococci or staphylococci in some other part of the bone of an experimental animal, to reproduce these phenomena without the complication of the teeth and to make some exact observations of the effect of these poisons on the connective tissue.

II. EXPERIMENTAL INFECTION OF BONE

It is often said that infection is a

*Constant and excessive mechanical stress, that is, trauma, will also cause bone to be absorbed, as is the case in orthodontic movement.[5] When teeth have been lost, the act of mastication on the remainder may constitute trauma of this order and cause loss of bone and loosening of the teeth. It will not, however, cause breakdown of fibrous tissue and pocket formation, which is the essential lesion in pyorrhea. Some authorities appear to have assumed that the loosening of a tooth due to undue masticatory stress is associated etiologically with the formation of a pus pocket. This is not the case, and it is not therefore surprising that the relief of the traumatic strain allows the tooth to tighten, but does nothing to eliminate the pocket or the pus, and merely gives an erroneous impression that the disease has been cured.

question of the seed and of the soil. It is also very much a question of the method of planting the seed. If a small quantity of a dilute broth culture of a mouth organism, such as *S. viridans,* is injected under the skin of a guinea-pig, there will be a transient inflammatory reaction; that is to say, a number of polymorphonuclear leukocytes will descend upon the invaders and they will probably disappear. If, however, they have a small blood clot in which to grow and get a foothold before they are exterminated, a small abscess will develop.

An initial difficulty was therefore to devise a method by which organisms could be introduced into bone and enabled to gain a foothold.

METHOD

A small incision was made over the symphysis of the lower jaw in a guinea-pig and carried down to bone. The tissues were slightly retracted and a hole was drilled in the bone. A fragment of cotton wool was dipped in a broth culture of the organisms and tucked into the hole in the bone, where it was left,

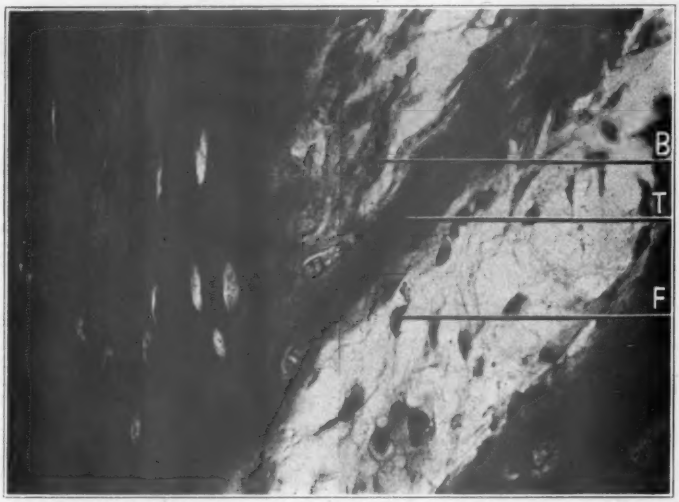

Fig. 9.—Photomicrograph of zone of stimulation. The bone cells are alive in the lacunae. New bone trabeculae (T) are being laid down by young osteoblasts (B), and young fibroblasts (F) are constructing new collagen fibers. (× 450.)

If a fragment of cotton wool is dipped in the culture and introduced under the skin, an abscess will certainly develop, for the germs can grow safely in the cotton wool; but if they are injected straight into the blood stream, it is unlikely that any harm will come to the animal. The organisms will probably be killed and eaten by phagocytes before they establish a foothold, unless an overpowering dose is injected.

a single silk suture being inserted to partially close the incision. In the cases to be described, *Staphylococcus aureus* was used, but both *S. haemolyticus* and *S. viridans* were also used and gave similar results. It is of great interest that though in some cases the most virulent and invasive hemolytic streptococci were used from cases of septicemia, the animals seemed to be none the worse for it, apart from the local reaction, and even

Fig. 10.—Photomicrograph of guinea-pig mandible artificially infected fourteen days earlier. The sequestrum (S) has now become separated by the osteoclasts. The infection has, therefore, grown unmolested right through it and killed the remaining osteoclasts. (Figures 11-12.) The organisms are, however, strictly confined to the sequestrum by the polymorphonuclear leukocytes (L). A heavy barrier of fibrous tissue (F) is growing around this area and, under cover of it, Howship's lacunae of the old zone of irritation are filling up with new bone (Figure 13). (×60.)

that did not appear to be causing them any inconvenience.

The animals were killed after intervals of from four to forty-six days, and the whole field of operation was excised, decalcified and sectioned. Wax sections were cut and stained with (1) hematoxylin and eosin, (2) van Gieson 's stain and (3) Gram's solution, in rotation throughout the series. It was thus possible to compare the distribution of the organisms in the Gram section with the histologic changes in the hematoxylin sections. Van Gieson's stain was used to indicate the collagen deposits and differentiate more clearly and easily the new bone from the old.

RESULTS

The results can be indicated in detail only by reference to Figures 4 to 10.

Certain significant facts emerge and are common, where they apply, to all the sections which were made in this series of fourteen experiments.

The organisms present were in every case recognized as of the same type as those implanted. The most important observation was that, in each case, the infection remained localized whether an extremely invasive and virulent hemolytic streptococcus or a noninvasive, attenuated staphylococcus was used. The organisms were entirely surrounded and confined by polymorphonuclear leuko-

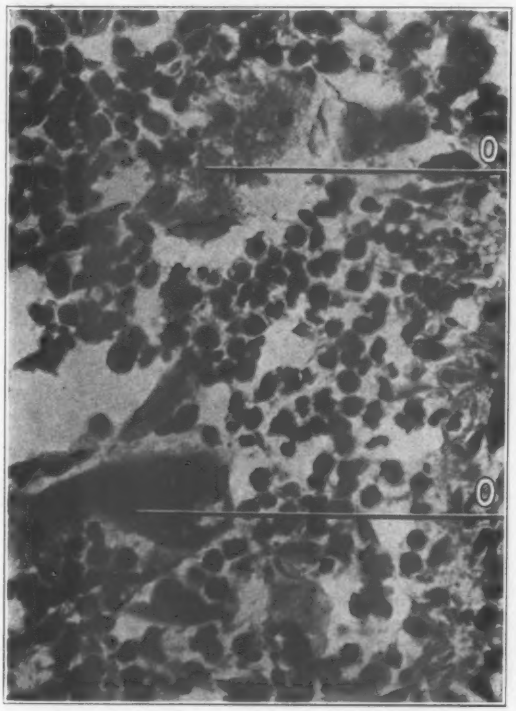

Fig. 11.—Photomicrograph of osteoclasts (O) which, being poisoned, have fallen away from sequestrum and are breaking up in the too toxic environment. (×500.)

cytes, and were not distributed at random in the tissues.

Four well-defined zones of tissue reaction could be recognized, as determined by the degree of irritation to which the tissues were subjected: (A) In the center of the lesion, the infection itself was present. (B) All around this point, the tissue, though not infected, was contaminated by the poisons which emanated from the infected area and killed the cells. (C) Farther afield, as the toxic matter became more dilute, it still proved a severe irritant. (D) On the outskirts of the lesion, the poison was so attenuated that it merely acted as a stimulant.

A. The Zone of Infection (Typical Cell, the Polymorphonuclear Leukocyte).—This is the only zone where the actual organisms were present. They were invariably confined to the area where polymorphonuclear leukocytes had entirely replaced all the normal cells. None were found invading the normal tissues beyond this area nor even were any seen in the round-cell infiltration which surrounded the central area. They were entirely controlled by the polymorphonuclear leukocytes.

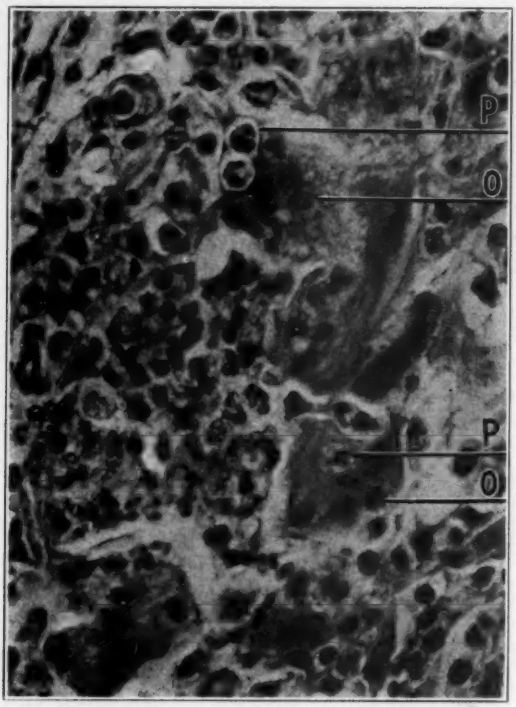

Fig. 12.—Photomicrograph (van Gieson section) showing polymorphonuclear leukocytes (P) entering and either devouring dying osteoclast (O) or seeking organisms in it. Organisms were occasionally seen in these disintegrating osteoclasts, but the leukocytes were always present; which suggested that they were actually absorbing the débris of the giant cells, most of which disintegrated entirely before infection reached them. (×700.)

Even among the leukocytes, there were very few bacteria at large. The organisms which survived after the first few

days were chiefly those which had grown into empty Haversian canals or traumatic fissures in the matrix made by the drill (Figs. 5-6) and so were out of reach of the leukocytes. The rest of the organisms which were not thus protected were found for the most part in the cytoplasm of the polymorphonuclear leukocytes. They were either being digested or, if too numerous, were no doubt infecting and killing the leukocytes, though the great majority of the white cells appeared to be alive as far as could be judged from their staining reactions. There were still a few organisms scattered about between the leukocytes.

B. The Zone of Contamination (Typical Cell, the Round Cell).—Although the actual organisms were confined by the leukocytes, their toxic products diffused into the surrounding tissues. Whether these poisons are exotoxins or merely tissue-breakdown products is not known, but in the area immediately adjoining the zone of actual infection, the concentration of this diffusible toxic matter was naturally at its height.

In this zone, the bone cells had died and had undergone autolysis in their lacunae, which therefore appeared empty. In the adjacent soft tissue which also lay within this zone, the normal cells of

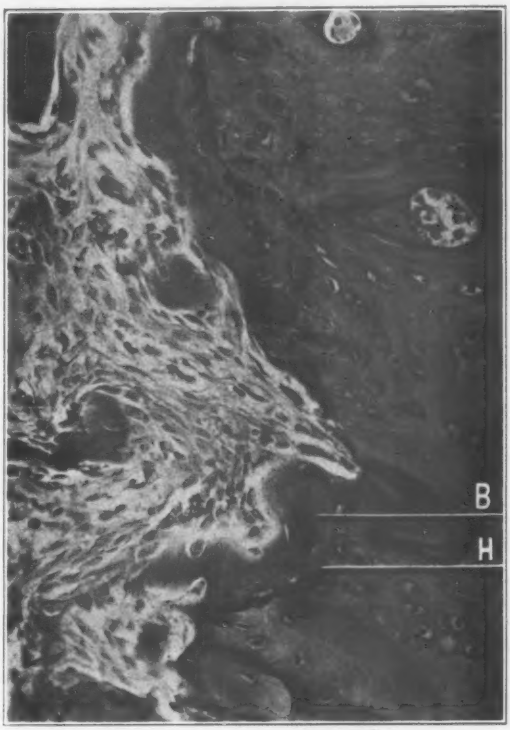

Fig. 13.—Photomicrograph showing Howship's lacunae (H) recently cut by osteoclasts in zone of irritation now being filled up with new bone (B) as toxic tide ebbs. (×220.) (Compare reactions described in Figures 4-13 with those in Figure 1.)

the area had for the most part similarly disappeared, and the remnants of the collagenous network which they had built and in which they used to live was invaded by round cells (Fig. 7). Indeed the whole of the soft tissue was converted into a mass of round-cell infiltration.

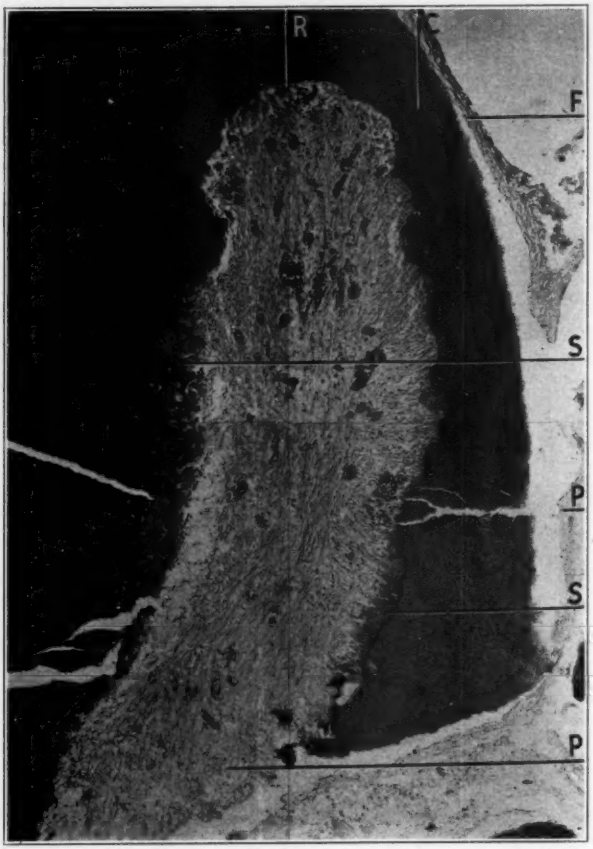

Fig. 14.—Photomicrograph of pulp chamber of human molar; natural reaction in pulp exactly comparable with experimental reaction in bone illustrated in Figure 4. F, zone of infection (subacute pulp abscess under caries). C, contaminated zone of dentin. R, osteoclasts at work in zone of irritation. S, zone of stimulation where calcific repair tissue similar to callus is being deposited. (×75.)

C. The Zone of Irritation (Typical Cells, the Histiocyte and Osteoclast).—Beyond the zone of severe contamination, where normal cells could not survive, the toxic matter had become more dilute by diffusion but was still sufficiently concentrated to constitute a serious irritant. This is indicated by the continued infiltration of the tissues by round cells, though among them here many of the normal cells had survived. The osteocytes contrived to do so, for instance, and the bone lacunae, which were empty in the zone of con-

tamination, begin once more to contain cells as usual. It is precisely at this point, where the concentration of poisons is such that the osteocytes can just survive, that the osteoclasts make their first appearance, eating away the bone matrix.

The collagen framework of the adjoining soft connective tissue is also being digested by histiocytes, the wandering scavengers of the reticulo-endothelial system which remove such insoluble refuse of the body as cannot be washed away into the lymphatics (Fig. 8).

The circumstances under which an osteoclast is produced are rigidly prescribed. The environment must not be too contaminated; on the other hand, a certain degree of irritation—toxic or mechanical—is necessary. No osteoclast is ever seen in the infected zone, nor can the osteoclast live in the intensely poisoned environment of the "zone of contamination"; on the other hand, it is never observed in the less irritated zone of stimulation where, as will be shown, new bone is being formed.

There can be little doubt that the osteoclasts and histiocytes are merely present in response to toxic irritation. They may be similarly produced anywhere. Moreover, being present, they are simply carrying on their usual function of tissue resorption. The interesting result of their activity is that they open up a gap in the bone all around the center of the lesion; as trees are felled to isolate a forest fire. The space thus obtained becomes filled with polymorphonuclear leukocytes, and until that has taken place, the danger of widespread bone necrosis remains.

The significance of this observation from the clinician's point of view is that bone resorption is easily recognized radiologically. The pathologic significance of the phenomenon is therefore so important that if its meaning should be misunderstood in the slightest degree, the whole interpretation of radiologic evidence in bone would be at fault.

The cardinal facts are that there can be no organisms present at any point where bone is actually being resorbed, though there must be severe irritation either toxic or mechanical; and, secondly, that bone resorption is a very rapid process, which, as will be shown, ceases as soon as the contaminated bone is removed and the irritation reduced (Fig. 13); or, alternatively, it ceases if actual infection invades the area where the osteoclasts are working and destroys the cells (Figs. 11-12).

D. The Zone of Stimulation (Typical Cells, the Young Fibroblast and the Osteoblast).—Beyond the zone of irritation in which the osteoclast and histiocyte thrive and which therefore is a zone of destruction or rather elimination of contaminated material, there is a zone of intense cellular activity which is constructive in purpose. The toxic products diffusing from the lesion have reached such a degree of dilution at this point that they no longer constitute an irritant, but act rather as a stimulant to the cells.

During the first few days after operation, the fibroblasts, in response to this stimulation, lay down a dense mat of collagenous fibers which have the appearance of a defensive wall built round the source of irritation. Under the protection of this barrier, osteoblasts build masses of new bone with amazing rapidity, but with no very obvious plan of campaign.

The new bone matrix is deposited all around on the surface of the old and, from its appearance, might be said to be "sprouting out of it," if the idea were not absurd. Actually, it is being deposited on the surface by a galaxy of very active cells, which are forming matrix at such speed that an unusually large number of them become enclosed in a most irregular fashion. Instead of lying perfectly orientated, with their lacunae flat-

tened in a plane parallel to the walls of the nutrient vessels and their canaliculi parallel to each other and normal to the plane in which the lacunae lie, the arrangement of the osteocytes is most haphazard. They occur at irregular intervals throughout the matrix, presenting tortuous canaliculi and appearing like a nest of spiders. Sometimes, two cells share the same lacuna and, in ground section, the tissue closely resembles dental cementum. This new deposit of bone is of course callus.

The foregoing description has been necessarily confined to the picture presented by the tissues just before sequestration takes place, but a moment's reflection will show that since the reaction at any particular point depends upon the concentration of toxic matter which reaches that point, rapid changes must be expected.

The infection growing along the empty Haversian canals slowly invades the zone of contamination, which, in turn, spreads outward so that the toxic matter overwhelms the osteoclasts. By this time, however, if things are going well, these cells have completed their work and cut off the portion of bone in which the cells have already died and which formed the zone of infection and the zone of contamination.

This separated central piece of bone now forms the sequestrum, and there is a hiatus all around it which is rapidly filled with polymorphonuclear leukocytes. Meanwhile, the infection continues to spread throughout the whole of the sequestrum. A few osteoclasts still cling to the sequestrum, but are already undergoing degeneration. They rapidly fall away and break up, unable to survive in such a toxic environment (Figs. 10-12). If they could survive and go on digesting the matrix, there would, of course, never be a sequestrum.

On the other hand, the organisms are now finally limited in their spread by the masses of polymorphonuclear leukocytes which fill the hiatus between the sequestrum and the bone. They will continue to flourish in the natural crevices of the sequestrum, fed by the serum which diffuses in to them. It is most unlikely, therefore, that the sequestrum will ever become sterile, but the organisms will be eaten at once if they grow out from it and meet the leukocytes.

At this stage (Fig. 10), farther afield, behind the leukocytes which surround the infected sequestrum, there still remains the massive round-cell infiltration which was previously observed in the zone of irritation. Gradually, the irritation becomes reduced as the infection is controlled and a layer of fibrous tissue forms among these round cells. The osteoclasts which remain on the edges of the surrounding bone protected by the fibrous barrier cease to eat away the bone and disappear, whereupon Howship's lacunae, which are left empty when these osteoclasts break up, become filled with new deposits of bone matrix or callus (Fig. 13). This deposit will ultimately fill up the entire wound in the bone if the sequestrum can be expelled along a sinus or be removed by surgical procedures.

It is significant to note that the reaction of the dental pulp to infection is precisely similar to that of bone. In all cases of chronic infection of the pulp such as chronic abscess or polypus, resorption of the dentin is seen.[8] Figure 14 shows a subacute abscess of the pulp. The zone of actual infection as shown by the Gram sections is confined to the abscess itself, which consists of polymorphonuclear leukocytes. The dentin near them is contaminated for some distance and no resorption of the matrix is taking place; but, beyond the grossly contaminated zone, osteoclasts are seen in a zone of irritation where they have eaten out a bay in the dentin. Farther away still, in a zone of stimulation, cells are building a calcified tissue of repair re-

markably like the callus in Figure 4. Indeed, the higher magnification of these tissues so closely resembles Figures 5-9 that they are not reproduced.

III. APPLICATION TO SURGICAL PATHOLOGY

If the complicated series of reactions which have been described are summarized and regarded as illustrating general principles, one cannot fail to be impressed with the inability of the organisms to invade the tissues, and the efficiency of the leukocytes in exterminating them if they are thrust in by force. It is not a question of a battle, but rather of a weed growing in new soil and falling a prey to the local fauna. The phagocytes cluster round the invaders in such concentration that they leave no means of escape, and, in the case of a small invasion such as the one described, the organisms are permanently imprisoned and are saved from total extinction only if they have a necrotic nidus in which to take shelter.

This explains why, after an ordinary extraction, the alveolar bone does not become deeply infected. Mouth organisms immediately enter the socket with the saliva, but before they can grow into the bone, masses of leukocytes crawl to the surfaces of the wound and eat them.

Occasionally, the bone does become infected because it was crushed at a moment when organisms had been driven into the blood stream by the pumping action of the extractive forces on the vessels of the periodontal membrane.[7] In this way, "dry socket" is produced, simply a localized necrosis of bone due to the convenient planting of the organisms in the crushed and coagulated vessels of the injured bone. "Dry socket" can be prevented by cauterizing the parodontal sulcus before extraction, but if this precaution is not taken, necrosis must take its course. Nothing but the application of local heat and sedatives will help, and scraping the bone simply breaks down all nature's barriers against a spread of the infection and positively invites a generalized osteomyelitis.

In a large lacerated and infected wound, such as those met with in general surgery in wartime, there are so many necrotic foci, which may consist of collagen fibers such as pieces of torn fascia, tendon or ligament, or may be foreign bodies or fragments of bone, that the whole limb is permeated by a mass of multiple abscesses, which rapidly coalesce. In such a case, before the necrotic material can be cut off and expelled, the patient may die of generalized toxemia, so great is the amount of poison diffused from the wound. Alternatively, vessel walls may be ulcerated through and fragments of purulent débris find their way into the blood stream so that the patient loses his life from pyemia even if he escapes secondary hemorrhage.

Another possibility of the gravest complications arises if virulent hemolytic streptococci are introduced even in small numbers. These organisms paralyze the leukocytes and cause an intense extravasation of plasma from the vessels. The danger is then that they will be swept into the lymphatic drainage system before the leukocytes are able to acclimatize themselves to the intense poison and commence to feed on them.

Even so, much depends on the way in which these organisms are planted in the tissues, and, in the present experiments, even the most virulent hemolytic streptococci from a case of septicemia were rapidly surrounded and completely controlled: perhaps because the bones acted as a splint to the lesion and prevented the organisms from being massaged into the lymphatics by incidental movements.

At the other extreme, we have the possibility that the invasion may be so slow and gradual that there is no acute onset. If infection gains a footing in the necrotic contents of a root canal, for

instance, it may be some days or even weeks before the organisms grow along the apical canals and reach the periapical tissues.

This slow onset allows time for the toxic products of the organisms to precede them, so that by the time they reach the periapical tissues, there is a definite infiltration of round-cells absorbing these poisons, and a group of polymorphonuclear leukocytes waiting at the opening of the canal to snatch the organisms when the first go through.

In this way, pulpless teeth develop apical granulomata quite painlessly. The root-canal broach, acting as a piston, spreads the pus of a pulp abscess throughout the pulp chamber as it removes the pulp; and the organisms grow along such ramifications of the canal as are too small or tortuous for the broach to reach. In these canals, unless some surgical wizard can disinfect, fill and seal them hermetically, the organisms may live as long as the patient survives, for serum seeping in will feed and oxygenate them and keep them moist while the polymorphonuclear leukocytes, their only enemy, cannot get at them.*

It was, however, for the purpose of illustrating the pathologic processes of pyorrhea that these experiments were designed, and they show that the disease is simply a special case of chronic septic inflammation of connective tissue. Inasmuch, however, as the disease involves four varieties of connective tissue, to wit, bone, cementum, fibrous tissue and the blood itself, the picture is somewhat involved.

Nevertheless, comparison of Figure 1 with Figure 4 shows that the reaction is precisely analogous. The zone of infection in Figure 1 is the débris of the pocket, where streptococci abound, and living polymorphonuclear leukocytes crawl about among the débris seeking them out. The toxic matter from this purulent mass soaks into the adjoining tissue through the ulcerated epithelium though the organisms themselves cannot pass the surface cordon of polymorphonuclear leukocytes.

A zone of contamination is observed beneath and the papillae of connective tissue are solidly infiltrated with round cells. No other cell survives. Any poison which the round cells fail to absorb follows the general direction of tissue fluid movement and drains away along the lymphatics. The contaminated area therefore corresponds in shape to their area of distribution and stretches out irregularly along the vessels which lead to the periodontal membrane.

At the edge of this zone, the poison has become sufficiently dilute to establish a "zone of irritation"; and, under the influence of the irritant, histiocytes eat away the contaminated periodontal fibers, and osteoclasts resorb the bone just as they did in the experimental animal (Fig. 4).

Here, however, we are dealing with a very slow and chronic reaction, and it is rare to find these phagocytic cells actually present. A search of the complete group of serial sections of three teeth *in situ* from which Figure 1 was taken revealed only five osteoclasts at work. On the other hand, there were numerous traces of old osteoclast activity. The edges of the trabeculae were everywhere indented with Howship's lacunae. Moreover, the more superficial periodontal fibers had been destroyed and even the cementum and dentin at an earlier stage in the disease and before the pocket was so deep had been resorbed and repaired. In such long standing cases, old Howship's lacunae in the bone have also be-

*Prevention is relatively easy, however. The first act on opening a pulp, before any exploring instrument is used, should be the gradual introduction of the heated root-canal drying point. This dries up and sterilizes the pulp so that subsequent instrumentation cannot pump infection into the apical canals.

come filled again with new bone as the toxic tide ebbs and flows; but the general tendency is toward bone destruction at the tip of the alveolar crest, as any roentgenogram indicates.

Figure 2, from another section, shows one of the rare osteoclasts at work, eating away the bony crest of the interdental septum. The bone was so contaminated just here that the osteocytes had died and the bone lacunae on the resorbing side are seen to be empty. As a rule, osteoclasts appear at the moment when the osteocytes are still just surviving, but undergoing degeneration.

Owing to the chronicity of the lesion, therefore, the picture differs somewhat in the number of cells affected at any one time, but the type of reaction is the same. The so-called sclerosis seen radiographically around the roots of teeth with old marginal gingivitis is due to bone deposition and corresponds to the zone of stimulation in Figures 4 and 9.

It is only possible to interpret a roentgenogram of the teeth and parodontal tissues affected by pyorrhea after studying the histologic picture carefully. For instance, we are now in a position to say that the area of bone resorption is not itself an infected area, but that the extent of bone resorption is, on the other hand, an accurate measure of the effect on the individual of the presence of the toxic matter which soaks in from the infected pocket. The rarefaction is therefore an indication not only of the local destruction caused by the poison, but also of the amount of general intoxication which the lesion is inflicting on the patient and of the patient's susceptibility to the irritant. Bone sclerosis is, on the other hand, an indication that the amount of toxic matter which enters is rapidly diluted to a point where it acts as nothing more than a stimulant and is probably doing little harm. This solves the crucial problem of diagnosis.

From the point of view of treatment, the knowledge that the infection is entirely confined to the pocket is of paramount importance. It is quite an elementary operation to cut away the wall of a pocket, and so eliminate the crevice in which the infection existed; and if the surface epithelium is kept hard and well keratinized by constant friction with a soft brush and rubbing with wooden points between the teeth, there can be no more seepage of toxic matter into the tissues, no more local destruction and no more general toxic absorption.[6] This achieves the essential object in our treatment.

This knowledge, based on conclusive experimental and clinical evidence, may be put to other uses. It shows how ill advised would be any interference with the bony crests in pyorrhea. The resorption shown in a roentgenogram indicates that the bone has already suffered enough from toxic contamination without further mechanical disturbance, and it is not infected.

Indeed, live bone should never be scraped: it is never infected. There is no such thing as "residual infection" in bone, because there was never any original infection in the living bone. If infection is left in an edentulous part of the jaw, either there will be a dead root retained, or a sequestrum of dead bone lying in a cavity filled with pus and granulation tissue, or there will be a foreign body or a suppurating remnant of cyst lining which constantly throws off dead epithelial cells. Some such necrotic nidus into which the infection can extend and escape the action of the leukocytes is absolutely essential; otherwise, there is no residual infection.

Even when a necrotic nidus is found, surgical interference must be limited to the removal of the foreign body, the dead root or the sequestrum. To scrape out the granulations is to remove nature's bulwark against any inadvertent spread of the infection which the operation

may involve. To scrape a dry socket is mischievous in the extreme.[7]

The most general application, however, of this new knowledge is that we can clear a mouth of infection and know that it is clean. Admittedly, if there are pulpless teeth, an element of doubt exists, but if the presence of these teeth is not causing any apical rarefaction, there is less poison being absorbed by the patient than there would be from one small pyorrhea pocket, an amount which does cause obvious bone resorption.

Apart from pulpless teeth, however, it is only necessary to remove all crevices and pockets from around the teeth, and to keratinize the epithelial attachment, to be able to give a clean bill of health. If we exclude the relatively rare parodontal abscess, it is safe to say that no live tooth with its pulp intact is infected below the line of the epithelial attachment.

SUMMARY

1. Earlier experiments[2] have shown that in chronic inflammatory lesions of the parodontal tissues, the infection is confined to a necrotic nidus and is not present among the living cells.

2. In pyorrhea, it is confined to the débris of the pocket; in apical infection, to the débris in the canals.

3. In the present series of experiments, organisms were introduced on a pledget of cotton wool into a hole drilled in the bone. The reactions were as follows:

(a) There was a central "zone of infection" wherein the organisms were rapidly controlled by the polymorphonuclear leukocytes.

(b) This was surrounded by a "zone of contamination," which was free from infection but was poisoned by the soluble toxic products of the infection which had diffused into it. In this zone, all normal cells were dead and were replaced by round cells.

(c) Beyond this was a "zone of irritation," where some normal cells survived, but which was heavily infiltrated with round cells. Very active phagocytosis occurred and the typical cells were the osteoclast and the histiocyte.

(d) Finally, at the periphery of the reaction, where the poisons are most dilute, a "zone of stimulation" appeared. Here only a few round cells were found, but very active fibroblasts and osteoblasts built masses of fibrous tissue and bone.

4. The result of this reaction was separation of the sequestrum and absolute limitation of spread of the infection.

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PERIODONTAL CONDITIONS OVER A PERIOD OF YEARS

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FOUR thousand years ago, the ancient Egyptians suffered the disease we now call periodontoclasia. An examination of the mummies uncovered and studied by Sir Marc Armand Ruffer clearly proves the fact that these ancient people exhibited in their jaws the evidence that pyorrhea was no stranger to them. Dr. Ruffer spent twenty years in gathering the data which were published after his death by his wife (and Dr. Moody, of Chicago). This book, "The Paleopathology of Ancient Egypt," contains great numbers of photographs of faces, jaws and teeth showing conclusively that pyorrhea was the commonest disease revealed in the embalmed bodies of the Egyptians, and that the next most common ailment was tuberculosis. This fact has been impressed upon my mind still further by study of the accumulated specimens in our great museums.

There is nothing particularly new or striking that can be said on the subject. One can, however, review briefly the growth of the science that deals with the treatment of this disease, and restate the greatest single outstanding fact regarding the disease that seems to be ignored or forgotten by many of us; namely, that the disease could not exist were it not for the rapid growth and development, on the sides of teeth and in the tissues surrounding the teeth, of enormous numbers of pyogenic bacteria.

Glancing back over the teachings in the colleges of dentistry and in organized dental societies, I am impressed by the fact that little or nothing was done in earlier years to prevent or cure diseases of the bone and gums surrounding teeth. Fauchard, of Paris, painted a clear picture of the disease as he saw it in the hospitals of Paris many years ago. His treatment, as outlined by himself, was practically the same as was adopted by those forward looking men in the practice of dentistry in the United States, then and now.

I am fortunate to have in my possession the records of the Connecticut Valley Dental Society, composed of a group of men from the thirteen original colonies. This society was organized November 10, 1863. The records were preserved, and were published in 1876 by L. D. Shepard, its first secretary. Dr. Shepard was, I think, one of the organizers of the Harvard College of Dentistry, and all his life he was interested in preserving the records of growth of the dental profession. One of the members of this society was J. M. Riggs, who became interested as early as 1825 in inflammation of the tissues surrounding the teeth. Dr. Riggs often observed that patients whose gums were sore and many who had lost their teeth invariably had teeth coated with salivary calculus. He observed, too, that many of them had

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no rot, or decay. He therefore tried to give relief in such cases by removing the accumulated calculus; which seemed to help. In addition to this, he applied astringents to the gums, and, to his joy, the disease yielded to his efforts. Teeth formerly loose became tight, and so such practice became routine with him. In later years, his work attracted the attention of the Connecticut Valley Society, and he was asked to join, becoming a leader in the work of the society.

June 11, 1867, the society met at Northampton, and the subject under discussion was salivary calculus. Dr. Riggs, at this meeting, advised the removal of calculus and the use of salt water and common tooth powder applied with rubbing sticks of Spanish cedar, with pumice stone for polishing. He then gave a clinic in which he treated the teeth of Dr. Goodrich, a member of the society. Dr. Goodrich reported the success of the operation performed by Dr. Riggs, and the improved condition of Dr. Goodrich's teeth and gums so impressed the organization that they voted to have an account of his work published in the *Dental Cosmos,* giving him credit for having originated a valuable method of treatment for a disease of the gums. They named it "Riggs' disease," and it was so called until the name given it by Fauchard in 1746 slowly came into use. Fauchard was born in 1680 and died in 1761. He coined "pyorrhea" from the Greek words meaning pus and a flow, and this name has been in common use for years.

Publication of the resolution adopted by the Connecticut Valley Association June 10, 1869, was made in the *Dental Cosmos,* page 414, volume 11, 1869, as follows:

> WHEREAS, the credit for originality in surgery is always conceded to the one who first publicly announces a new operation, appliance, or method of treatment,
>
> *Resolved,* that, in the judgment of the Connecticut Valley Association, the credit of originating and first publicly describing a new treatment for the cure of inflammation of the gums and absorption of the alveolar processes, or the so-called "scurvy of the gums," thereby saving and restoring to comparative firmness the loosened teeth, is due to Dr. J. M. Riggs, of Hartford, Conn., he having detailed his method of operating to this Society years ago, and illustrated it at the request of the Society, by a clinic upon Dr. E. M. Goodrich of Westfield, Mass., at our meeting at Northampton in June, 1867. He also operated in Boston in August, 1866, with acknowledged success, upon Dr. D. K. Hitchcock.

Of course, bacteriology was unknown at that time, for Pasteur had not yet published his conclusions regarding the principal cause of disease; namely, that there exists a specific bacterium for every disease. Pyogenic cocci had not been thought of then. Had such knowledge then existed and been used by dentists as the young Scotch surgeon Lister used it in surgery, laying the foundation for the brilliant progress of the major surgery of today, our progress as periodontists might have been equally brilliant and rapid, and preventive dentistry would have become a fact at once, instead of just the plodding thing of the past. I am glad to believe that our progress has been expedited as the teachings of Pasteur have been emphasized and adopted.

So much for our beginning. It seems to me as I look back over the past that our advance has been signalized by three ideas: 1. Instrumentation. 2. The methods of successful, outstanding men who scaled and polished teeth. In this group are Riggs; D. D. Smith, of Philadelphia; Fones, of Bridgeport; Younger, who finally located in Paris; Patterson, of Kansas City, and James, of Chicago, who gave us many helpful ideas. 3. Bacteriologic research. My own contributions have varied owing to the fact that I commenced to teach in both the college of medicine and the college of dentistry

as an undergraduate instructor in 1890, a time when the only bacteriology mentioned or taught was recognition of the tubercle bacillus and the gonococcus. Consequently, I have seen bacteriology develop into the great science of today, and I hope too that our profession will make more use of Pasteur's marvelous discoveries. I therefore emphasize prevention of the growth of pus organisms about the teeth. We early learned that the human mouth has at all times growing in it, especially on the necks of, and in between, the teeth, infinite numbers of germs. Observation, measurement and computation showed that pus germs predominated, and that it takes 26,000 streptococci to measure 1 inch. With my eyes to the lens of the microscope, watchful waiting proved to me that the streptococci multiply by division, one becoming two, and two becoming four, etc., doubling every thirty-five minutes. Therefore, they never grow old. This means that they crowd under the free margin of the gum, where their poisons irritate and their powerful digestive ferment breaks down tissues, making pus. I restate these fundamental facts because they are ignored or forgotten by some of us; hence, their value is lost to many. So I urge you to consider how you can best apply them in daily practice.

Perhaps my own greatest contribution was to prove beyond a doubt that heart, joint and kidney diseases of the human body were and are due in a great degree to the spread of pus germs from dental abscesses and from pyorrhea pockets. Animal experiments prove that from 30 to 45 per cent of rabbits when inoculated with pus germs from the human mouth have heart, joint or kidney disease, and, finally, Dr. Bell found that even Bright's disease could be caused by inoculating a Rhesus monkey with pus from dental abscesses. I took great pride in believing that this idea originated with me, until in 1912, when I found an article in the *London Practitioner Limited* of April 1912, by Kenneth Goadby, who told of curing two patients of acute rheumatism by removal of abscessed teeth; and notwithstanding my work antedated his publication by three years, as often happens he printed his findings first, for I did not realize the importance of early publication of new facts regarding improved health. However, as far as I know, Goadby has done no work on heart or kidney disease.

EXPLANATORY

After graduation in medicine in 1894, I spent most of my time in teaching in the medical and dental colleges of the University of Minnesota. This, together with the fact that I then too taught pathology as an instructor under my chief, J. Clark Steward, professor of pathology, in the college of medicine, and was taught by him to perform postmortems under his direction, he explaining to me as we went along (for he loved to teach) the significance of what we found, gave me an insight into some of the evidences of human disease as we then understood them. This experience, together with the fact that I often noted rapid recovery from acute rheumatism following extraction of diseased pyorrheic teeth of infirmary patients, caused me to believe that our teaching that if a tooth could be made comfortable, no matter how badly diseased, it should be retained in use was wrong, and this conclusion led me to criticize the substance and methods of our teaching to Weston A. Price, of Cleveland, who subsequently organized the Research Commission and raised $4,000 by subscription to be used in original investigation.

To him, I owe much, for he pressed me hard to prove and publish my revolutionary ideas regarding mouth infections, which I was reluctant to do. He

offered me the money, $4,000, then in his hands for research, which I refused. He then made a trip to Minneapolis for a conference with the president of the University of Minnesota, George E. Vincent, who approved his ideas and directed that I organize research on the relations of mouth infections to general disease of the body. My work and teaching made it necessary to obtain help. My first associate in this work was secured from Chicago. He was great in experiment, but without ability to correlate. Our students named him Metchnikoff. He, in turn, was followed by a brilliant, competent man, who became a great researcher, Arthur T. Henrici, whose work, with my own, revolutionized the practice of dentistry as regards the maintenance of diseased teeth in the human mouth. We undertook to prove, by animal experiment, that it was an unsafe practice to permit badly diseased teeth to stay in the mouth, and proved that my criticism made earlier to Dr. Price was justified.

No finer results have been attained by periodontists today than those of Alfred Fones, of Bridgeport, Conn., or D. D. Smith, of Philadelphia. They tried hard to popularize their methods. Just why were their results so good? Answer: Because they reduced bacterial growth on teeth to the minimum, and so polished the teeth of their patients that the daily cleansing by the patient for himself was made more effective. Their methods also increased the circulation in the gums. The Fones school to train young women to aid the dentist in this work was a good thing, deserving praise and support. Neither Smith nor Fones emphasized "bacterial cleanliness"; nevertheless, they unwittingly attained it. Their practice was "just cleanliness." It was the foundation rock on which their fine results rested.

Dr. Fletcher, of Cincinnati, first taught us the value of splitting open deep pyorrhea pockets to release pus, an idea which I amplified, in addition protecting sensitive areas of root surface thus exposed by a covering of metecement. This method was improved by A. W. Ward, who gave us a surgical packing for the protection of exposed areas.

In the matter of medication, nothing that I have used has been so satisfactory as the 0.5 to 2 per cent solution of sodium ricinoleate, the value of which was proved in the department of bacteriology of the University of Minnesota. It is not an antiseptic in any sense of the word, but it does have the power to neutralize both germ toxins and ferments in solutions of from 0.5 to 2 per cent. It detoxifies poisons of all bacteria except one, *B. botulinus.* I have never heard a valid criticism of this preparation, which we now can obtain as a powder, paste or liquid, use of which reduces bacterial activity and promotes healing.

The bibliography of this disease reveals a tremendous list of remedies and treatments, the very great number of which would seem to indicate a divergence of opinion as to the etiology of the disease. A considerable number of men have contributed remedies to be used by the patient in the daily care of teeth and gums that have been more or less useful, most of them having for their principal characteristic mild antisepsis and astringency, quite in line with the ideas Riggs practiced in 1825, more than 100 years ago.

One of the remedies that I have used much I obtained from Thomas P. Hinman, who received it from one of the oldest dentists of Georgia, Dr. Harris. It consisted of two solutions, the first made by saturating beechwood creosote with all the iodine crystals that it will dissolve, which slowly evolves a very mildly anesthetic black solution. This is applied to the pyorrhea pocket with a smooth probe. Superimposed upon this solution immediately before saliva touches the first ap-

plication is a second solution, a saturated solution of tannic acid in glycerine. The union of these two solutions before saliva has touched them produces a protective waterproof covering which will cling to the tissues for twenty-five hours or more.

At one time, Frank B. Lawrence, of Eldorado, Kan., had a remedy which I found very useful. It is made by digesting wood in sulfuric acid, this powerful escharotic solution blanching gums painlessly, so that the tissue to be removed comes away almost as satisfactorily as though it were excised.

A good astringent solution for the patient's daily use has been compounded by Dr. Charters. In fact, most of the remedies advocated by men in the active practice of periodontia have some value.

No medication, however, can take the place entirely of vigorous daily care by the patient himself. Taught to use a toothbrush properly, and to employ No. 4 cotton rolls, cut in three-quarter inch lengths and held in a 6-inch curved hemostat, for rubbing tooth and gum surfaces, and also how to wrap ordinary toothpicks tightly with cotton and thrust the cotton wrapped pick or "stimudents" between the teeth, patients can themselves remove living germs from the tooth neck at the gum margin.

A great step was taken when the periodontists organized their own association twenty-five years ago. This has proved of great value in bringing together the men and women interested in periodontia in one group, where ideas can be exchanged to the profit of the whole group. The American Dental Association also has recognized this type of work by creating a section in the Association devoted to this subject.

It is manifestly impossible to name the outstanding individuals who through the years have contributed greatly to the formation and growth of the Academy of Periodontology. I cannot refrain, however, from paying an affectionate tribute to the memory of Gillette Hayden, whose enthusiastic devotion to this work was of great value and will be long remembered by those of us who had the good fortune to know her.

I here do honor to Henry Barnes, of Cleveland, who first taught us interdental brushing at a Tri State Meeting at Putin Bay, long, long ago. It was a step forward. Dr. Fones taught us a circular motion method which both cleaned the teeth and stimulated the surrounding soft tissues. Next came a still more vigorous method of tooth cleaning by interdental tooth brushing demonstrated by Dr. Morton, at Milwaukee. In the same week, Dr. Charters demonstrated much of the same type of cleaning. My own work, which was also interdental, was after that of Dr. Barnes, except that I pressed the gums back to scour the tooth root side as one would push cuffs back to wash one's wrists, cleaning only two or three teeth at a time and applying the brush to both labial and lingual surfaces, always thinking of three things: first, getting rid of pyogenic bacteria; second, stimulating circulation in the gums, and, third, by pressure with the sides of the toothbrush bristles, emptying what I conceive to be sacculated ends of venous capillaries, thus reducing swelling and expelling bacteria which had lodged in these tissues into the blood stream so that the phagocytes could destroy them.

Of course, I endeavor to plane all calculus from the tooth roots without damaging the cementoblastic layer of the root, trying by friction and pressure to so reduce pocket depth that new epithelium can cover the pyorrheal ulcer to the full depth of the pocket, only splitting open the pocket when complete healing can be attained in no other way.

Slowly through the years, step by step, our knowledge has grown, and I beg you

to note that our greatest benefits have come from those activities that resulted in reduction of bacterial growth on and about the teeth.

Another step forward was made when the Academy of Periodontology instituted the publication of its excellent bibliography on this subject, from its early beginning to the present time. Such patient, exacting work deserves the gratitude of us all.

Through the years, tremendous advances have been made in our knowledge of vitamins, so necessary to normal growth and repair. The periodontist of today who neglects to acquaint himself with the foods which furnish these necessary substances overlooks a factor in treatment which sometimes means the difference between success and failure in certain of his cases.

It seems to me, as I glance over the records which show our advances in scientific knowledge of this subject, that there has also been a marked advance in our knowledge of the relationship between traumatic injuries affecting the periodontal membrane and the bony foundations in which the human teeth rest. I for one certainly believe that traumatic injuries to the periodontal tissues make the ingress of destructive bacteria into those tissues much easier than if the circulation of the blood had not been interfered with by trauma. Viewing the matter in this light, the periodontist must strive to correct and prevent traumatic occlusion.

It therefore seems to me that a glance at our science through the years of accomplishment and discovery has placed a greater and greater burden on the periodontist, demanding of him the qualities of a true scientist.

The material for this paper has been gleaned through a period of years of service as an instructor and later as professor in the college of dentistry of the University of Minnesota on the subject, "The Relationship of Infections of the Mouth and Jaws to Metastatic Infections"; also as professor of research in the college of medicine of the University of Minnesota, where I taught until very recently. My experiences have been accumulated in the clinic of the College of Dentistry, the University Hospital, the Northwestern Hospital, on the staff of which I still serve, ten years of service at the Abbott Hospital and many years of service at the Hillcrest Hospital. For five years, I also enjoyed service in the medical section of the Council of Defense. In this council, I represented the dental profession in its several interests. I also enjoyed a period of service on the staff of the Surgeon General of the United States, as a member of a group of three advisors, who were appointed to represent the activities of dentistry at the time C. T. Messner served in the group as its chairman.

IMMEDIATE DENTURE SERVICE

By MERRILL G. SWENSON, D.D.S., New York City

IMMEDIATE denture service means the construction of the dentures before all the remaining teeth are removed. They are inserted while the anesthetic is still effective. Some of the advantages are:

1. Elimination of the humiliating edentulous period.

2. Less pain, the denture acting as a splint to protect areas.

3. Improvement in appearance due to (a) less change in muscle and supporting structures and (b) the presence of the same or an improved vertical dimension.

4. Improvement in health because infected teeth are not retained so long.

5. Increase in degree and duration of stability due to (a) less resorption of bone and (b) tissue resiliency. Old edentulous mouths lose resiliency; hence, there is less seal.

6. Less difficulty in repositioning surrounding structures. The tongue spreads and the cheeks fall in when the patient is without teeth for a great length of time.

7. The fact that artificial teeth are set in the identical positions of the old ones. Therefore, the same arch form, the same arch position, size and shape and the same individual rotations and inclinations are maintained. Improvements may be made by agreement of the patient and the dentist.

8. Reproduction of color, fillings and markings.

Read before the Section on Full Denture Prosthesis at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 25, 1938.

A full complement of anterior teeth is not necessary for use of the immediate method. Any remaining teeth serve as a guide to the correct position of the new teeth and as to arch form, arch position and individual shape. I prefer removing the posterior teeth, using the bicuspids as a stop and allowing the jaws to heal for about ten to twenty days previous to construction of the denture. This divides the healing time, reduces the shock and provides a settled base for stability and biting pressure. The mouth preparation should not involve too many undercuts, and the ridges should be shortened when exfoliated teeth have brought the bone down, a fact which is overlooked too frequently.

IMPRESSIONS

The impression is taken with compound and lined with a zinc oxide and eugenol paste. The labial section is taken with compound and also lined with paste. Softened compound is placed in an edentulous tray and carried into the mouth. This material is seated so as to have an overextension in all areas except the labial section of the teeth and soft tissues. After it is taken out of the mouth, the metal tray is removed. The compound is now trimmed to the height and width of the mucobuccal fold, sufficient bulk being left well in the soft tissue behind the tuberosities. The compound is cut to the incisal edge of the remaining teeth, and the undercuts are scraped and cut in the compound on the lingual side of the teeth to allow a greater bulk of paste. This bulk of paste in the undercuts on the lingual side insures

against breakage on removal from the mouth.

The two ingredients are mixed in an unhurried manner. The setting is not accelerated until the mixture comes in contact with the moisture of the mouth. This allows the operator to be deliberate. The material is spread over the entire surface, including the top of the border, and placed in the mouth with a firm pressure for thirty seconds while the patient works the lips. Now the pressure is eased and the impression held from three to five minutes for setting. Another indication for setting time is fingernail pressure. When the compound dents with difficulty, it can be removed. If the paste flows through the interproximal spaces, this excess is clipped off, to facilitate removal from the mouth. If too much paste has flowed onto the labial surface of the cuspids, this excess is trimmed off while the impression is in the mouth.

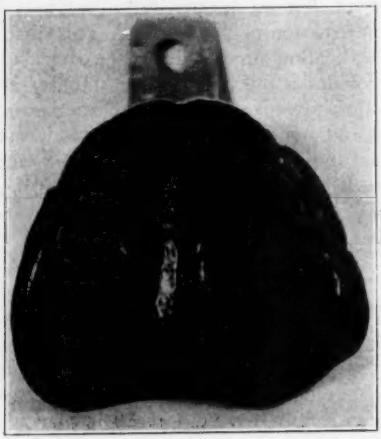

Fig. 1.—Snap compound impression with sufficient bulk to insure workable thickness with overextension as to height and length.

The impression is now removed from the mouth and, with a very sharp knife, the edges along the incisal section are squared up. The labial section is started with compound pressed lightly against the teeth, with the other posterior part of the impression in the mouth. This labial compound is covered with paste and carried to place under the lip. After it sets, the forefinger is placed over the border in the tuberosity region and pulled down, thus removing the posterior part of the impression first.

Needless to say, there are other acceptable impression methods. Among them are (1) section compound, (2) compound and plaster wash and (3) compound and hydrocolloid. An impression of hydrocolloid alone will not control border height and width and posterior length.

Fig. 2.—Compound impression trimmed to correct height and width and cut away to be entirely free from touching remaining teeth.

BITE RELATION AND MOUNTING

Bite relations are established in the same manner as for free saddle partial dentures. The base-plate is loosely adapted and compound is painted over the inner surface of this base-plate with dry heat. Then the cast is held in boiling water until thoroughly hot. The compound and base-plate are again warmed

by dipping in hot water. The base-plate and compound are pressed and adapted to the hot cast. The hot compound will flow freely under the warm base-plate. This compound-lined base tray is an exact fit and a vast improvement over the base tray alone. Wax rims are now added. The wax is slowly warmed to considerable depth and the patient allowed to close into it. Care is taken that the patient close in centric relation and not in the worn centric occlusion. Most patients gradually wear the bite into a protrusive or lateral relation. Therefore, it is best to start them in correct centric

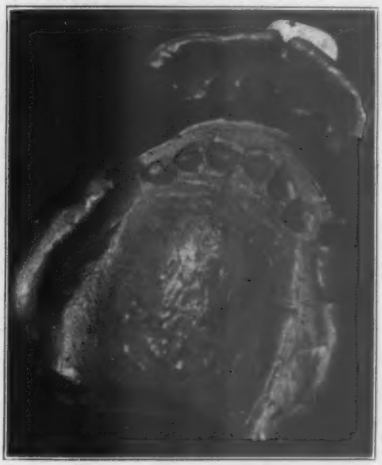

Fig. 3.—Impression taking. A wash impression of zinc oxide and eugenol paste is taken inside the compound. After this section has been removed from the mouth, the paste is trimmed around the teeth to have a square sharp border. The labial face piece is taken by adapting the compound loosely, it then acting as a carrier for the paste.

relation. If wear warrants, the correct opening is reestablished. The bite fork is attached if a face-bow is to be used. The face-bow is adjusted and removed from the mouth. If an adjustable machine is used, wax is placed betwen the rims and the patient is requested to protrude the mandible about one quarter inch. This protruded wax is chilled, removed from the mouth and set aside. The case is then mounted.

COLOR AND MARKING CHART

The cast furnishes the shape and size of the teeth, but not the shade and markings. It is a simple process to sketch the six anterior teeth and label the individual shade, type and location of each filling and type and location of checks and spots.

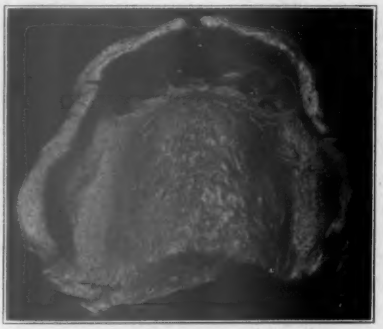

Fig. 4.—Finished labial section luted in place to finish impression. No separating media are required.

Fig. 5.—Base-plate lined with modeling compound to insure close adaptation and prevent warpage. Without the anterior part of the mouth to rest on, the bite-rims rock very easily in the transfer, this causing many of the bite inaccuracies. Use of this specially lined base-plate prevents many of these errors.

PLACING ANTERIOR TEETH

The plaster teeth are removed one at a time and replaced by a porcelain tooth, alternately, to maintain the exact width, length and relation of the natural teeth. With a cross-cut fissure bur, the center of the plaster tooth is cut down first and then the balance removed with a knife, to preserve the gingival line and contact points of the adjoining teeth. Cutting about 3 mm. into what would be the socket and fitting the artificial tooth into the space and socket gives the same inclination, rotation and occlusion as in the former tooth. The first tooth is waxed in place with sticky wax; then a tooth is skipped and the next one adapted. This process is continued until all porcelain teeth are in place. We should then have a natural reproduction with undesirable features omitted, if there are any.

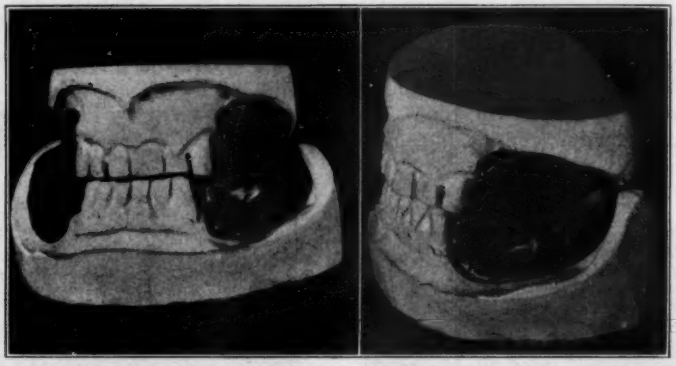

Fig. 6.—Left, centric register; right, cast in place.

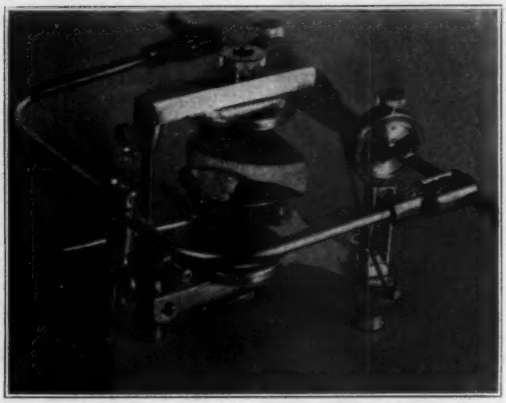

Fig. 7.—Maxillary cast held in correct relation to articulator by means of face-bow transfer.

PLACING POSTERIORS

In this paper, it is not the intention to dwell on posterior tooth positions and occlusion. It is well to say, however, that

bone preservation and lasting stability depend on reduced cusp height and more favorable leverage and balance in eccentric positions starting from correct centric.

CAST PROCESS TRIMMING

The case is waxed and flasked in the regular manner. In the first half of the flask after opening, an anterior ridge resembling an untrimmed mouth with freshly removed teeth will be seen. The sharp projections are removed without going to the bottom of the pseudo-sockets. The gingival labial corner is removed and smoothed to provide space for denture base material, so as to not thicken or protrude the lip. The removal of this portion also removes undercuts. Any previous bone resorption around the teeth, due to disease, obviates as much trimming after extraction. The trimmed ridge now simulates the future ridge after an alveolectomy.

Fig. 8.—Postdamming on cast. The length back of the tuberosity is found by slipping the T-burnisher into the maxillary notch. The length between these two points is established by the vibrating line of the soft palate.

TRANSPARENT CELLULOID SURGERY GUIDE

A piece of base-plate wax is adapted over this newly trimmed cast in the flask. Another second half of the flasking is flowed over this wax. Now the wax is warmed and washed out. Twenty-two-gage transparent celluloid is now placed over the cast to fill the space created by the wax. This is placed in a press, where the pressure will adapt the celluloid to the cast. Upon chilling, it retains the shape of the edentulous cast. After removal of the teeth and preliminary removal of bone, this celluloid is tried in the mouth. Owing to its transparency, one can readily see the high spots. These spots are removed and the procedure is continued until the celluloid goes to place without impingement.

Fig. 9.—Incisal view of alternate removal of teeth, showing removal of plaster of tooth socket, especially on labial aspect to accommodate ridge lap of porcelain tooth to be inserted.

INSERTION OF DENTURE

Some projections of vulcanite and teeth may show on the inner surface of the denture. These are ground flush with

the surrounding surface. The upper anterior borders must necessarily be thin in these cases. The inner surface is cleaned with alcohol and the denture inserted and inspected for bite relation accidents.

The denture should be kept in place quite steadily for the first twenty-four hours, as this helps to prevent hemorrhage and allows the tissues to adapt themselves to the denture. The patient can then have rest intervals of one hour after the first day.

TEMPORARY REBASE

A temporary lining of zinc oxide and eugenol is placed on the inner surface about the fourth day, if retention is insufficient. This impression material on the inner surface is worn for about a month. The slow setting and long flowing qualities of the zinc oxide and eugenol reduce the hazard of changing the bite.

PERMANENT REBASE OR DUPLICATION

After three months, the paste is removed and a new rebase impression is taken. The case can be rebased or it can be duplicated from this impression. Duplication means that all the old denture base material is replaced by the new, the teeth being held in the same relation.

Bone conservation is the keynote of all good denture work and the first aid to that is correct centric relation. Balance in eccentric positions aids still further to conserve bone and thus preserves stability. Checking, so as to positively know whether the mounting is correct, is possible and essential before grinding for correction of occlusion. The bite is registered with soft wax over the teeth and a mounting is made. Then another is taken in the mouth and the wax is put back on the machine to see whether they correspond, this being repeated several

Fig. 10.—Removal of teeth from cast. The plaster teeth are cut off alternately to preserve their exact positions. The contact points and gingival line are carefully preserved to maintain the mesiodistal inclination and labiolingual inclination and rotational position of each tooth, as well as to keep the entire arch in proper relation to the head.

Fig. 11.—Porcelain tooth shaped and fitted, and held in position by sticky wax to replace those just extracted and in turn to maintain relation of remaining plaster teeth.

times, from the mouth to the machine. They are taken in the mouth with shallow indentations and then tried on the articulator and this check should be taken regardless of the type of machine or the technic used.

GRINDING

The mounting having been found correct, the incisal guidance is set as near zero, or flat, as possible because the vertical bite (overbite) has been reduced to the smallest possible amount. The gual surfaces of the lower teeth. This grinding must be done with stones, so as to determine the desired location of porcelain removal. The final smoothing is done with carborundum paste. For a complete study of grinding for balance, I refer you to an article, "Fundamental Principles in Correction of Occlusal Disharmony Natural and Artificial," by Clyde H. Schuyler.[1]

CONCLUSION

Immediate denture procedure elimi-

Fig. 12.—Remainder of anterior porcelain teeth placed as determined by position of teeth already set up. The position of the posterior teeth is governed by leverages, orientation of the plane, the patient's condylar guidance and the incisal guidance as determined by the patient's overbite, which has been altered according to the operator's judgment.

condyle slots are set by the protrusive bite. The flatter the incisal guidance, the flatter the cusp inclines. The shallower the cusp inclines, the less the lateral and protrusive thrust on the dentures, and, hence, the greater the denture stability. On the working side, areas of lateral interference are ground from the buccal surfaces of the upper teeth and the lin-

nates the humiliating edentulous period. It insures a natural appearance. It reduces soreness and healing time. The ability of the patient to manipulate the dentures is developed in far less time. The bony and soft tissue foundation is more favorable; hence, stability is as-

1. Schuyler, C. H.: J.A.D.A., 22:1193, July 1935.

sured for a longer period of time. The importance of the relation of occlusion to stability, however, must not be overlooked.

PATIENT INSTRUCTION

Patients must realize that the mouth under an "immediate denture" has a healing period just as in the usual method of tooth removal. One is becoming accustomed to artificial dentures and recovering from extraction at the same time. The advantages are many; yet we have to be patient during the learning and recovery time.

It is a fact, however, that there is a much longer learning period with the other method of making dentures. The total amount of discomfort from the two operations is far less than with the two procedures separately. Therefore, the disadvantages of being without teeth for weeks and months far outweigh any disadvantages that may be connected with the immediate denture method. It is understood that some correction, such as relining or duplication of the denture base material, usually is necessary in a few weeks to compensate for the rapid mouth changes. The fee for this measure should be agreed on in advance.

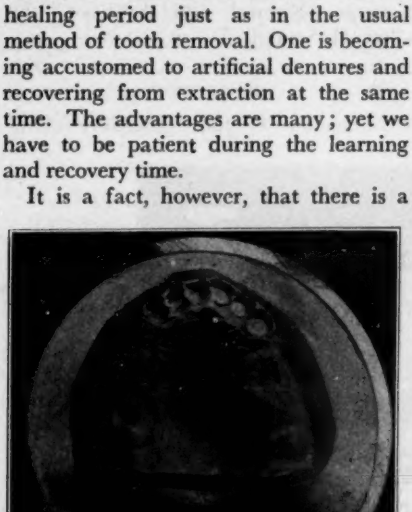

Fig. 13.—First half of flasking, after separation and before trimming of cast.

Very little chewing is expected at first, because the bite has not been adjusted and the staying qualities are limited. The stability improves with adjustment of these two factors.

The denture should be kept in place steadily the first twenty-four hours, if possible. If removed, it should be out less than five minutes. An ice-pack should be used up to fifteen minutes out of each hour. Longer rest periods are advisable later. The patient must return for his appointment the next day.

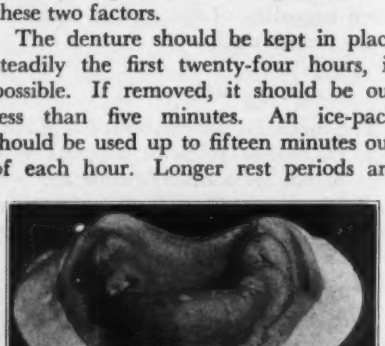

Fig. 14.—Anterior ridge arbitrarily trimmed on stone cast to simulate ridge. This trimming is done in the first half of the flask after separation.

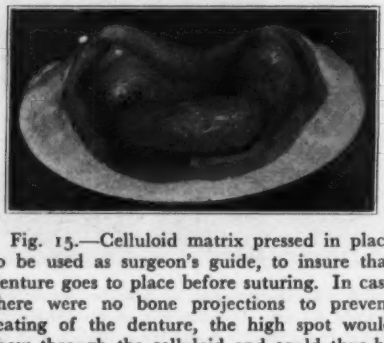

Fig. 15.—Celluloid matrix pressed in place to be used as surgeon's guide, to insure that denture goes to place before suturing. In case there were no bone projections to prevent seating of the denture, the high spot would show through the celluloid and could thus be detected and removed.

104 East Fortieth Street.

DISCUSSION

S. Jaffee, Washington, D. C.—There can hardly be adverse discussion as to the advantages that a patient derives

from the insertion of dentures the instant the teeth are removed. I have been practicing and advocating immediate denture insertion for many years and have yet to hear a single valid objection to its use, unless the patient is hospitalized on account of ill health or is financially unable to secure this valuable service. Even in such cases, the dentist should take the upper and lower impression in dentocoll, or a similar material, to preserve the cranial relationship of the natural teeth. As Dr. Swenson has said, even if there are only a very few teeth left, the impression will still be of inestimable value for the proper placement of the artificial teeth, regardless of whether immediate restoration is resorted to or not.

And while we are on this subject, I cannot help repeating a statement that I have made many times before, and that is that I would almost like to see a law passed providing that no dentist be allowed to extract the last teeth in a patient's mouth without previously obtaining an impression of them. This remark is directed particularly to our oral surgeons. Can any one see a reason why we should burn all the bridges behind us, destroy the natural landmarks and then have to guess and grope our way back? With an immediate reproduction, the chances for making errors are considerably minimized.

Dr. Swenson has already given many reasons why he believes in immediate restoration. I am not only in accord with all that he has said, but, with your permission, would like to add several more pertinent reasons:

1. The problem of securing a pleasing esthetic effect ceases to be a problem if an immediate restoration is made, for all we have to do is to copy, or reproduce, nature.

2. The patient is not given a chance to go dentureless, and as no one has seen him without teeth, pride will prevent him from removing them even if they are not entirely comfortable at first, and before long he grows accustomed to them.

3. As the dentures are placed in the mouth while it is still anesthetized, the patient is not conscious of their presence, and as the anesthesia wears off, he becomes accustomed to the new dentures.

4. The jaws will not become tired, since the dentures retain the habitual vertical dimension.

5. The dentures act as a bandage on the sore gums.

6. The expression of the face is scarcely changed, and the patient will not acquire abnormal mandibular movements and wrong habits of mastication.

There is not time to enumerate all the advantages of immediate dentures, but those mentioned should be sufficient, it seems to me, to convince any practitioner.

I should like to take this opportunity to congratulate Dr. Swenson on the careful and precise technic which he uses. I have no doubt that he achieves excellent results with it. I thoroughly agree with him that the best practice is to remove the posterior teeth and let the tissues heal, and thereby provide at least a part of the mouth with a solid foundation.

I do not know whether the scope of this discussion allows consideration of technic, which is really a personal matter. The technic used to construct dentures by one man with perfect success may prove a failure in the hands of another. Each dentist should use the technic which gives him personally the best results.

Dr. Swenson did not say whether he rebases the dentures or makes new ones when the tissues have healed. We employ a somewhat different procedure in our office. During years of specializing in this field, I have found that the average patient can neither afford, nor is he

inclined, to have an extra set of teeth made. Hence, naturally, the first or original dentures must be made so that they positively function with rebasing only.

C. O. Flagstad, Minneapolis, Minn.—Immediate placement of dentures is becoming popular because it is desirable, the public demands it and the service has proved successful. The change from a natural denture to an artificial one is a very trying experience and determination is necessary to surmount its difficulties. The dental profession should enlist every "human drive" to help the patient "over the hill." Immediate denture service provides the most compelling force to persistency that we have at our command and, if for no other reason, its practice would be desirable. If we permit people to go without teeth, their pride diminishes and we lose our greatest ally for perseverance.

It is a generally accepted fact that to become a successful user of artificial dentures, a patient must break down a series of habits detrimental to their presence and retention in the mouth and build up habits favorable to their retention and use. The longer the period between the extraction of the teeth and insertion of artificial ones, the more complicated the problem becomes. Immediate service overcomes many of the usual difficulties experienced by a patient.

The service has been successful and has been practiced by various methods for many years. Standardized technics such as the one presented today have been described in our literature quite regularly for the past ten years.

I am sure Dr. Swenson, in his desire to caution us, did not wish to leave the impression that immediate denture service is a procedure for the specialist or exceptionally skilled man only. If this were true, I should not be interested in the practice, because I am a teacher of undergraduate students, whose chief business it will be to serve the public in a general practice. Neither the surgery, when necessary, nor the technic of construction is beyond the possibilities of the average practitioner. If the average practitioner has the courage to make an immediate denture, he will find this a service he *can* render and a very desirable asset to his practice. In the past five years, we have constructed an avererage of more than seventy-five of these dentures annually in the college and the work is all done by students. I have had the pleasure this past year of presenting this subject in every part of our country, and when I later meet men who have seen and heard the presentation, I receive one testimony after another that they were encouraged to attempt the service and now it is an integral part of their practice. May I hope to stimulate some of you to try it?

Our technic of construction and instruction differs from that of the presentation as follows: 1. Model process trimming and placing of teeth. 2. Use of a transparent celluloid surgery guide. 3. Instruction to the patient and the procedure following insertion of denture. I shall present our variation not because of any criticism of Dr. Swenson's technic, but because it is different, and perhaps our logic might be interesting to you. It is my opinion that the technic of procedure is a secondary consideration, for if we have a vision of what we desire, we will work out a technic to secure it.

1. Model process trimming. Dr. Swenson does this after the flasking of the case. We do it at the time of the set-up, the reason being that every case requires a different type of trimming and it cannot be reduced to a routine. Our rule is never to remove any more plaster than is necessary to properly seat the teeth and restore the natural appearance, as we desire to conserve the bone in the mouth. There is a great variation in the amount of trimming: sometimes there is

none at all, at times very little, and occasionally considerable. We trim one side of the anterior portion of the arch at a time and use the natural side as a gage for restoring the outlines of the artificial side.

It is my opinion that with more than 75 per cent of practitioners sending their cases to the commercial laboratories for processing, the method suggested by Dr. Swenson for model trimming after flasking is rather impractical.

2. The transparent celluloid surgery guide. It has always been our belief that such a guide is of little value since, at the time we desire to use it, the field is in a very unsatisfactory condition, as blood is flowing quite freely. It is my experience that once we become familiar with the objectives of this service, we can readily determine from a cast and study of the mouth just how much, if any, bone it is necessary to remove. It has also been my experience that if we perform the surgical work ourselves, it will not be long before we can intelligently gage the amount of bone to be removed in the mouth. We make an extra cast and trim one-half of the anterior portion to the extent it was done on the original and use that as our guide. In my opinion, the transparent guide has little value. The trying-in of the actual denture, with the advantage of having the teeth for testing, affords a much better indication as to its seating.

3. Instructions to the patient and the procedure following the insertion of the dentures. Dr. Swenson's instructions to the patient are as follows: "Keep the denture in the mouth quite steadily for the first twenty-four hours. After the first day, the patient may have rest intervals of one hour." We insist that the patient keep the denture in the mouth continually except for cleansing until the wound is healed. There are three very definite reasons for this:

1. The tissue in the area operated upon, if released from the confines of the denture, may swell to such an extent that it will be impossible to reseat the denture. It is also much more painful to remove the denture and replace it than to keep it continually in position.

2. It is the contention of many men doing this work that the denture serves as a matrix or mold for the formation of the ridge. My experience has been that this does occur to some extent; and, therefore, the denture should be kept in the mouth continually during the preliminary healing process.

3. One of the advantages of immediate denture service is to make the transition from a natural denture to an artificial one easy and successful. The best "drive" you can give the patient in accomplishing this adjustment is to insist that the denture be kept in place. If he will follow this procedure for a week, most of the trouble incident to wearing dentures will be overcome.

It is our practice to discourage the use of adhesive powders or pastes for filling in the denture as suggested by Dr. Swenson, for any material placed inside the denture, whether powder, paste, cotton or whatnot, creates excessive pressure, with resultant resorption. It has been my contention that the successful user of dentures, after a short period of time, does not depend so much on the "physical retention" present in the denture, but more on the adaptability of the tissues in the mouth to supporting the denture under various strains and stresses. Adhesive powders and pastes create a false retention and therefore inhibit the formation of normal, in fact, desirable, habits of adaptability by the patient.

The use of zinc oxide paste as suggested by Dr. Swenson for temporary relining is neither desirable nor necessary except in rare cases. We have found such pastes difficult to keep in position, as they soon wear down. It also makes the denture difficult to keep clean.

The matter of rebasing these dentures cannot be reduced as suggested to a

routine of definite time. We inform our patients that the denture may need rebasing or reconstruction within the year, but the matter of a definite time is left to the judgment of dentist and patient.

There is a great variance in ability to master the wearing of dentures with a changing retention. There is also considerable variation in the change of tissues. Many of our patients have worn immediate dentures for a number of years now without reconstruction, and, as far as is discernible, these dentures are perfectly satisfactory. After all, the human element enters into the problem, and it will vary with the temperament, mouth conditions and finances of the patient.

Immediate denture service is within the skill and fee limits of the average general practitioner. There is nothing mystical or extremely difficult or overly dangerous in this service. In fact, the variables are much less than in the construction of dentures when the teeth have been out for a period of time.

FRACTURES OF THE MALAR BONE

By John L. Doherty, M.D., F.A.C.S., and Joseph A. Doherty, D.M.D., M.S.D.,
Boston, Mass.

THE literature pertaining to injury of the facial bones furnishes rather meager information concerning fracture involving the malar bone and zygomatic arch. This fact may be attributed to the infrequency of such injuries in the past. However, the high speed of the automobile age has been a most potent factor in injuries to the face. Associated with fracture of the nasal and jaw bones, there has been an increasing number of malar fractures. Since the malar bones are anatomically united with the maxillae, fractures involving them, particularly when improperly treated, may create problems in dental prosthesis. Therefore, if the functional and cosmetic requirements of the patient are to be satisfied, it is obvious that accurate diagnosis and reduction must be instituted.

From the Department of Oral Surgery, Carney Hospital.

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ANATOMY

The malar bone, which is small and quadrangular, is situated at the upper and lateral part of the face. It forms the prominence of the cheek, part of the lateral wall and floor of the orbit and parts of the temporal and infratemporal fossae. It presents four processes: the frontosphenoidal, orbital, maxillary and temporal. The frontosphenoidal process articulates with the zygomatic process of the frontal bone; the orbital process forms, by its junction with the orbital surface of the maxillae and with the great wing of the sphenoid, part of the floor and lateral wall of the orbit; the maxillary process articulates with the maxilla, and the temporal process unites with the zygomatic process of the temporal bone.[1] The greater part of the masseter muscle originates from the zygomatic arch, the fibers being attached to the lower border and medial

surface. Although strong, the malar bone is held in position by rather frail supports. Susceptibility to the effects of mechanical force may be ascribed to this specific structural weakness and to the protruding position occupied by the bone, which assists in binding the maxillae and skull together.

Injury is always the result of the application of direct force. The fracture invariably the blows have been delivered at right angles.

DIAGNOSIS

Fractures of the malar bone may at first be overlooked, because of the swelling which most often accompanies and masks the injury. Subsidence of the inflammatory reaction commonly presents a characteristic facies. The natural full-

Fig. 1.—Skull showing malar bone with articulating surfaces heavily outlined. Fracture most commonly occurs in the regions of articulation.

Fig. 2.—Anterior-posterior roentgenogram; fracture involving left infra-orbital ridge and zygomatic arch.

line most often involves one or more of the four processes, especially the articulating surfaces. The body of the bone is usually displaced rather than fractured. The types of fracture generally observed are the result of force exerted from in front, in back, above or below. When the main part of the bone is broken, ness of the cheek is replaced by a flattened appearance, and comparison with the opposite side reveals a marked difference in the contour of the face. Depression of the infra-orbital border may occur. Extensive displacement of the bone from its normal anatomic position may cause pressure on the coronoid proc-

ess of the lower jaw and thus interfere with mandibular movements. Palpation of the arch through the overlying skin will aid in locating the site of fracture. Digital pressure, alternately applied within and outside the mouth, most often produces crepitus. Ecchymosis of the orbital contents is frequently observed. Injury to the infra-orbital nerve may cause symptoms of either pain or numbness in the area in which the nerve is distributed; namely, the upper lip and side of the nose.

When the malar bone is crushed by the impact, involvement of the maxillary sinus necessarily occurs. In this case, hemorrhage into the antrum follows.

Fig. 3.—Case shown in Figure 2, after reduction.

Epistaxis on the involved side is a common symptom. In all cases, clinical findings should be supplemented by a roentgenographic examination. Because of the difficulty in projecting the bone into proper view, roentgenographic confirmation is not always possible of attainment. A roentgenogram of the skull, taken vertically from below upward (Stone's position), tends to throw both zygomatic arches into relief. An anterior-posterior view is helpful in showing any existing depression of the infra-orbital border and cloudiness of the maxillary sinus.

TREATMENT

Those cases of fracture of malar bone in which there is no displacement do not require any special treatment. However, since the most logical and frequent result of the fracture of the zygomatic arch is depression of the fragments, the aim in treatment would naturally be the elevation of the parts to the normal anatomic position. Many ways of accomplishing this object have been advocated. The passing of a steel wire hook through an external incision,[2] the use of a heavy towel clamp or tenaculum to draw the bone outward,[3] the insertion of an instrument through the nasal fossa[4] and numerous other methods have been employed. The external approach has many disadvantages. There is the possibility of scar formation; great force is necessary for reduction, and, in the case of fleshy persons, difficulty is generally encountered in grasping the bone. However, the method of choice should satisfy the following requirements: The reductive process should be an uncomplicated one; there should be a minimum of scarring, and, lastly, the development of infection should be controlled as far as possible. With these aims as criteria, it is our intention to limit this discussion to two intra-oral methods which have given excellent results in our hands.

When the lines of fracture are such as to involve the processes, with consequent displacement of the malar bone and depression of the arch, the following procedure may be carried out: The cheek on the side of the injury is extended so as to expose the lateral aspect of the maxilla. A horizontal incision is made through the mucous and submucous tissues in the buccal sulcus in the region of the molar teeth. A hemostat is used to create an avenue to the site of fracture. A thick blunt instrument, inserted through the cut membrane, is carried posteriorly so that its edge rests on the

temporal bone. The position of the instrument is then medial and inferior to the zygomatic arch. With the handle firmly grasped and the side of the skull utilized as a fulcrum, the elevation of the parts becomes a problem of the proper application of force. As a guide to accurate reduction, the fingers of the opposite hand may be placed along the arch on the side of the face. Ordinarily, hemorrhage can be controlled by the application of pressure.

When the malar bone is crushed as a consequence of bearing the brunt of an impact, access with a view to reduction of the fracture is best obtained through the canine fossa. A semilunar incision, with the convex side toward the alveolar ridge, is made in the cuspid area. The mucous membrane and the periosteum are then elevated and the underlying bone is exposed. By means of rongeurs, chisels or surgical burs, the maxillary bone is penetrated and a window created in the antrum. Through this opening, a direct approach to the site of fracture is possible. A heavy metal probe is inserted in the antrum and lateral pressure exerted, the fractured bone being thus forced outward to its former position. Any blood clot is removed, and antral lavage is instituted during the period of convalescence.

In most cases, no special means of keeping the fractured zygoma in place is necessary. Only on rare occasions is it found advisable to utilize a headcap with an extension arm. When a fracture is accompanied by traumatization of the masseter muscle, with resulting pain and difficulty in opening the mouth, immobilization of the jaws by simple wiring is suggested.[5] The period of fixation should be limited to about ten days.

SUMMARY

The incidence of fracture of the malar bone and zygomatic arch has definitely increased in recent years. This increase in frequency may be attributed principally to the greater use of automobiles. Emphasis is placed upon the necessity for accurate diagnosis. Many methods of treatment have been employed, external procedures particularly possessing disadvantages. This paper has been limited to a discussion of reduction by two methods utilizing the intra-oral approach.

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PROBLEMS ASSOCIATED WITH OPENING THE BITE WHICH WOULD CONTRAINDICATE IT AS A COMMON PROCEDURE

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IT is not my desire to condemn the practice of changing the maxillomandibular open relation, or to discourage those doing or desiring to do this form of reconstructive work. I appreciate the value of the service that may be rendered in selected cases. I also recognize the understanding that many men, especially members of your organization, have of the problems associated with this form of mouth rehabilitation, also their technical ability to render this service with due regard to the esthetic, biologic and mechanical problems involved. I do not wish you to interpret this discussion as applying to the dentureless or near dentureless case.

Much has been written about the many advantages that can be obtained, or that we can expect to obtain, by opening the bite and rebuilding the occlusal surfaces of the teeth: the more youthful expression, the relief of complex head pains and defective hearing, the improved masticatory ability, the correction of speech defects, restoration of the oral health, and many others; all of which we know to be creditable aspirations and at times possible of accomplishment. However, too little has been written about the biologic and mechanical problems involved as a word of warning to the one less familiar with this work who unexpectedly finds himself surrounded with complications from which he has no exit; complications, I might add, which one most experienced in mouth rehabilitation might find difficult to solve and relieve.

H. D. Grubb[1] has given a detailed explanation of his technical procedures in mouth rehabilitation. Many pitfalls would be avoided by carefully adhering to these procedures.

The teeth, muscles of mastication, temporomandibular articulation and associated structures present a most complicated mechanism. For the past century, mandibular movements have been discussed and efforts made to reproduce them in a mechanical device. Today, we have several instruments which will reproduce these movements sufficiently accurately for all practical purposes. However, the positioning of casts, the adjustment of the instruments and the re-forming of occluding tooth surfaces so that the inclines will harmonize in function present problems the solution of which is subject to error and dependent on the knowledge and the dexterity of the operator.

One who has made a sincere study of the masticatory mechanism has a keen appreciation of its complexities. He realizes also that the future health and happiness of his patient are at stake when he undertakes reconstructive procedures which necessitate a change in the maxillomandibular relation and the re-forming of occluding tooth surfaces.

The axiom that "we learn by trial and error" is true. Here, however, we are dealing with a human mechanism, and before we tear apart Nature's gift, we

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must be sure that we can not only rebuild it, but also improve upon it. As mentioned before, the future health and happiness of the patient are our responsibility. It is true that the careful, experienced operator may perhaps restore the face to a more youthful appearance, relieve varied reflex or localized pains, improve hearing, restore the oral tissues to a state of health, etc., with all the beneficial effects upon the general well-being of the patient. Lack of knowledge and error in judgment or technical procedures may, however, be a factor in many of these complications. In the past few years, I have seen many such patients, who might be classed as physical and mental wrecks, patients whose condition might be attributed to restorative procedures.

REPORT OF CASES

CASE 1.—A man, about 50 years old, editor of a magazine and who had studied medicine, while enjoying reasonable health and comfort, had a few of the natural teeth ground because of evidence of trauma. Thereafter, he became increasingly conscious of his teeth and experienced general oral discomfort. Later, some of the teeth were removed and restorations made. This work was done over several times without the desired relief. Finally, after about three years, all the teeth were removed and several sets of dentures were made. As a result, the patient was a "nervous wreck." He complained of never having a comfortable jaw relation. Although a man of good judgment, he expressed a preference for death to a life with continued oral discomfort.

CASE 2.—A woman, about 60 years old, had two or three lost teeth restored by fixed bridges with fair tooth support. An effort had been made to open the bite, the occlusal surfaces having been rebuilt four times in the past three years (twice in the last six months). Margins of all inlays showed unusual care and ability. The patient complained of uncomfortable maxillomandibular relation and lack of occlusal harmony. She had lost much weight and strength in recent months and was being cared for by a psychiatrist, with trained nurses in constant attendance. She attributed her physical condition to oral discomfort. The patient was of the neurotic type and the physician was disinclined to believe that occlusal disharmony was a factor in her physical condition. Interdental splints were made for this patient and she has been relieved of the strained jaw relation of which she complained.

CASE 3.—A man, about 55 years old, the head of a manufacturing firm, had had an effort made to open the bite and rebuild the occlusion. The bite had been changed six times in about eight years, with a gradual loss of supporting teeth. This work had been done by men of good reputation. The patient complained of continued occlusal discomfort, and owing to the fact that he was constantly "fussing" with his teeth, his was classed as a mental case. The remaining teeth were removed and full dentures constructed, with the result that he experienced greater comfort than he had in years.

CASE 4.—A woman, about 32 years of age, who had a bad arthritic condition, experienced severe pain in the region of the temporomandibular joints, more pronounced on the right side. Suffering had been continuous for two years. The patient had visited many physicians and dentists during that time. Her condition was diagnosed as arthritis and no relief was given. At the time that she appeared at the clinic, trismus had developed, making it difficult to insert a tongue depressor between the teeth. As arthritis seldom affects the temporomandibular joint, it seemed that another complicating condition must be present. A study of the occlusion revealed that a bridge supplying two teeth on the left side was in premature contact. The bridge was removed, and as the trismus was gradually relieved, the occlusion was balanced. In a few weeks, the patient could open the mouth normally and was relieved of pain. Later, much needed restorative work was started at the clinic. This work necessitated rebuilding of the occlusal surfaces of all the teeth. During reconstructive work, the slightest degree of occlusal disharmony would cause a recurrence of pain in the region of the temporomandibular joints. Since the completion of the restorative work at the clinic, the patient

has experienced a slight discomfort at times, but very mild in comparison to that previously experienced.

CASE 5.—A girl in her early twenties, who was referred by a dentist recognized as having an exceptional understanding of occlusion, had her teeth ground to relieve occlusal trauma. She had become very conscious of the occlusal condition and, in a desperate attempt to give relief, additional grinding had been done. At the time that the case was referred, the girl was extremely nervous and had lost much weight. She had developed the habit of grinding her teeth both night and day. The teeth and the supporting structures were sensitive to occlusal stress. The patient had lost much confidence in the attending dentist and had been given the name of a prominent periodontist, who had been well recommended to her. Confidence was an imperative factor and I did not discourage her in her final decision, her dentist also agreeing to this.

I could go on with a long list of patients who have experienced what would appear to be unnecessary discomfort because of changes in the occlusion, either by grinding the occlusal surfaces of the natural teeth or by oral rehabilitation necessitating the re-forming of the occlusal surfaces.

It might be well to analyze some of the apparent causes of oral discomfort. Most dentists are familiar with the destruction of the alveolar supporting tissues around one or more teeth, due to uneven distribution of occlusal stress in centric or eccentric maxillomandibular positions.

More recently, much thought has been given to pain about the face and head due to an abnormal jaw relation or cusp interference. James B. Costen, M.D., has given much information on the subject. While some of these conditions are due to the abnormally closed bite, a great majority are due to a lack of occlusal coordination.

Most common is the subluxation of the temporomandibular joint. This is invariably caused by premature contact in the region of the second or third molars in either the centric or the eccentric relation. The first indication of injury may be the clicking or snapping of the joint in eating. Following this, occasional stiffness or muscle soreness may be noted. The next stage may be acute pain and soreness, which is often followed by trismus. Subluxation may also be caused by unexpectedly biting on a hard substance in the molar region. This condition, of course, is quickly relieved by rest. The first condition can be relieved by eliminating tooth or cusp interference, and seldom if ever necessitates as a relief measure opening of the bite and mouth rehabilitation. These areas of interference, being posterior to the center of muscle force, act as fulcrum points and place a strain upon the capsule and ligaments of the temporomandibular joint during mastication, or whenever force is exerted to bring the anterior teeth in contact.

Reflex facial pains, as discussed by Costen, most often result from a lack of posterior tooth support or premature contact of the anterior teeth. In this instance, the center of muscle force being in the region of the first molar, the anterior teeth act as the fulcrum point and the temporomandibular joint functions under pressure. This pressure may be vertical, lateral, posterior or anterior, the tooth or cusp inclines acting as a guide as the jaws are closed. In the prognathous case, the mandible may be drawn forward, the condyle head resting upon the articulating eminence. I have dissected several temporomandibular joints of which the meniscus had been perforated. Some anatomists assert that these conditions have existed from birth, but as wear may be apparent on the condyle head or articulating surface, it would seem that the continued pressure of the meniscus in function might have caused the perforation.

Many have questioned Costen's conclusions regarding the cause and relief of reflex head pains, ear conditions, etc. Many other advances of a scientific na-

ture have been received with similar skepticism. While, early in his work, he may have been over enthusiastic and may have adopted or advocated extreme or unnecessary measures to obtain relief, in some instances he has been misunderstood, as he has not (as some would believe) attributed all cases of deafness or all head pains to dental origin. As time passes, however, we may conclude that dentistry has a more important part in relieving these conditions than is now believed.

In a paper read at the Midwinter Meeting of the Chicago Dental Society in 1938, Herman Chor,[2] M.D., in speaking of trigeminal or glossopharyngeal neuralgia, said, "It should be emphasized at this time that no dental condition, infected or traumatized or impacted teeth, however severe, can cause tic douloureux. The pain of dental origin is totally different from true neuralgia."

Chor tends to support a recent explanation of trigeminal neuralgia given by Frazier:

> He has suggested that the syndrome is due to peripheral stimulation of the fifth nerve in the presence of a thalamic lesion. The thalamus is a large mass of gray matter located deep within each cerebral hemisphere. It is the chief subcortical sensory center, in which most of the afferent sensory pathways have their destination. From the thalamus, sensations are relayed to the sensory cortex, where they are appreciated as perceptions. It is well established that lesions of the thalamus give rise to spontaneous pain and dysesthesia. The patient experiences outbursts of hot or cold or burning pain of a disagreeable nature referred to the contralateral side of the body. There is also an over-response to peripheral stimuli, so that stimuli which under normal conditions produce mild sensations of touch, pain, hot or cold, or indeed may even be subliminal, now evoke supraliminal and even extremely painful sensations. Such hyperpathic responses are characteristic of central lesions and their location has been verified by surgical experiments on human beings. Further investigation, however, is needed to substantiate or disprove Frazier's hypothesis that trigeminal neuralgia may be of this nature.

At present, I am inclined to believe that further study of these problems may prove Dr. Chor to be in error. Should Frazier's theories be true, might the thalamus lesions not be aggravated by continued irritation of the fifth nerve?

In July 1937, a woman was referred to me who had a condition diagnosed by competent men as trigeminal and glossopharyngeal neuralgia. It appeared to conform in every way to Dr. Chor's description of a true neuralgia, the paroxyms of pain occurring without prodromal symptoms or warning. A slight touch, a jar, as in stepping off a curb, or a slight gust of wind might start it, or at any instant in speaking, sharp knifelike pains might radiate through the throat and tongue. The condition had existed for a period of about twelve years, but had become progressively worse. This patient was seriously considering plans for a nerve resection, but was persuaded to have needed dental restorative work done first. No posterior lower teeth were present. The lower anterior teeth occluded anteriorly to the upper teeth. Roentgenograms of the temporomandibular joint confirmed the belief that the nerve injury might be of a dental origin. Partial dentures were made, restoring the normal occlusal support and balance. Slight change was noted in the first three months, at which time it was learned that the patient was leaving the dentures out a portion of the time. The importance of wearing them constantly was impressed upon her.

From the time that the patient started to wear the appliances continually, a gradual improvement has been noted and, at present, the condition is almost completely relieved, the paroxysms of pain being very mild and infrequent.

More recently, another woman, aged 65, came in for dentures. Before the examination, she spoke of a facial condition, which she said had been diagnosed many times as trigeminal neuralgia, characterized by paroxysms of pain affecting the right side of the face, passing up over the temple and eye. The condition had been present about thirty years. The patient was wearing a full upper artificial denture opposing which there were

only two bicuspid teeth on the right side. It was evident that this patient had not had a normal or innocuous occlusal relation for a long time. There appeared to be a definite lateral shift of the body of the mandible to the left, and there was evidence that an injury of long duration might exist in the temporomandibular articulation on the right side. Dentures were delivered early in July. Recently, the patient stated that facial pain had been decidedly reduced and that she was experiencing comfort unknown for many years.

Time will prove or disprove my feeling that this condition known as facial neuralgia may be caused by occlusal disharmony. In the meantime, a serious effort should be made to relieve those suffering from it by eliminating occlusal factors that might be responsible for it.

Our inability to give immediate relief to any of these patients who are suffering from pain about the temporomandibular joint or reflex head pains should not be accepted as evidence that such relief is not possible by dental treatment. Overconfidence in our ability to establish an innocuous occlusal relation should not lead us to accept failure in giving relief as positive evidence that occlusal harmony is not the key to the solution. Abnormal jaw relations may have been of long standing. The obtaining of a desirable relation may be most difficult. To assure the desired results, it may be necessary to treat certain cases by progressive steps.

I would suggest, in treating these cases, the use of cuspless teeth in full dentures, or a similar cuspless surface upon splints when they are used. This lack of cusp control or guidance may make possible the elimination of existing strained jaw relations.

With the assistance of H. M. Seides, working at the New York University Dental Clinic, relief has been given to approximately 100 patients suffering from neuritis or referred pain of various natures, by relieving occlusal disharmony. Experience has shown us the importance of roentgenograms, both intra-oral and of the temporomandibular joint, and mounted study casts, together with a careful oral examination and case history in diagnosis. Too often, one missing factor may lead to error in diagnosis. While I find roentgenograms of the temporomandibular joint of great value, I consider that diagnosis and treatment planning from them alone may be subject to grave error.

Chor speaks of psychalgia, or mental pain. I have encountered cases in which I have suspected this condition. With our limited knowledge of these symptoms and the causes of local or reflex pains about the head or face, it has often been a simple exit for us to classify them as mental cases. These cases, however, deserve more sympathy and serious consideration. If imaginary, the suffering is as serious as though the pain were real, and all possible causes should be eliminated in an endeavor to effect relief.

The average practitioner has been slow to recognize his inability to master all phases of the science of dentistry. The medical man recognizes the value of the specialist, and the specialist does not regard consultation with other specialists as a reflection upon his professional knowledge and ability. Dental science has advanced rapidly. The dental specialist today is a necessity. A more general recognition of this fact will enable dentistry to render an advanced health service in all phases of dentistry. In our clinic, we hear many pathetic accounts of suffering from disorders of the temporomandibular joint. These patients oftentimes could have been spared years of suffering had they received early attention.

I have called attention to occlusal disharmony and its relation to local and reflex pains as a warning as to what may ensue from a change in the maxillomandibular opening and the re-forming of occlusal surfaces, if the reconstructive

work is not in harmony with the biologic and the mechanical factors.

Our first problem is to determine the degree of opening or change that will be tolerated in the individual case. An excessive degree of opening will result in trauma or intrusion of the teeth until the undue strain upon the muscles of mastication has been compensated.

Our second problem is to obtain an innocuous centric maxillomandibular relation at the desired opening, a relation which will remain permanent on the completion of reconstructive procedures —a static relation between the jaws when the teeth are closed together, uninfluenced by inclined planes, with a general and even distribution of occlusal forces.

Reports have been made of changes in the maxillomandibular relation following mouth rehabilitation. Occlusal surfaces were rebuilt in what appeared to be a normal maxillomandibular relation, after which the mandible appeared to drift. Sometimes, this change is bilateral and at other times more unilateral, at all times necessitating the mutilation of occlusal surfaces as formed. A slight change of vertical dimension may at times cause a noticeable change in the relation between the condyle head and the glenoid fossa. Undesirable conditions may have resulted in pathologic changes or other abnormal conditions in the temporomandibular joint which it is necessary to correct before restoration is completed; or normal muscle tension may cause a change in the temporomandibular joint, incidental to the slight vertical opening. When a centric maxillomandibular relation is established and occlusal surfaces are rebuilt, with these undesirable influences present, a disharmony of cusp interdigitation is a natural sequence.

The wearing of splints for a short period of time will aid in the elimination of disharmony. Splints should be void of cusp interdigitation, as only then is a natural adjustment of the maxillomandibular relation permitted. When two splints are used, I form them to conform to a segment of a sphere. When only one splint is used, the flat splint contacts only the cusp points of the opposing teeth. To many, experience has proved the fallacy of arbitrarily protruding the mandible during oral rehabilitation. In so doing, the condyle heads are taken out of normal rest position in the glenoid fossae and a disturbance in occlusion results.

The third problem is the rebuilding of occluding surfaces.[3] In other articles, I have discussed the biologic and mechanical problems involved.

In eccentric maxillomandibular positions, an innocuous distribution of occlusal forces is present only when there is harmony between similarly grinding tooth inclines, of both adjacent and opposing occluding tooth surfaces. These inclines must in turn be coordinated with factors in the direction of movement of the condyle head in its numerous excursions as related to the glenoid fossa. Anterior tooth guidance alone can be arbitrarily selected by the operator. As the steepness of the guiding inclines of the posterior occluding tooth surfaces are influenced materially by this factor, it seems desirable to select a more nearly horizontal anterior guiding incline, thereby reducing the lateral functional stresses upon all the teeth. Disregard of these biologic and mechanical factors results in uneven distribution of occlusal force in eccentric maxillomandibular positions and may cause the destruction of alveolar supporting structures, subluxation of the temporomandibular joint or reflex head pains.

I might mention, as an added problem, the insertion of restorative work (inlays, crowns, bridges or partial dentures) which has been accurately designed and constructed, properly coordinating all parts. One unit improperly placed may be responsible for any of the complications discussed.

When considering the advisability of this work, the dentist must give serious

thought to the patient's physical ability to endure the chair work necessary for its successful completion.

If two hours of chair time is used in the construction of the common mesioclusodistal inlay, from four to six hours may be necessary when the vertical dimension is being changed and all occlusal surfaces are to be re-formed. Patients may desire to hurry the work to completion, suggesting several hours per day on consecutive days. Too much haste in any form of extensive restorative work may lead to a nervous collapse of the patient. In discussing restorative work of this nature, the patient should be informed of the time factor. His complete confidence and cooperation are essential at all times, and he may lose confidence and cease to cooperate if the nerve strain is too extreme or if unexpected demands are made upon his time. If the dentist has not properly evaluated the time that will be necessary for the completion of the work, and has not advised the patient of these facts, he may find, before completion of the work, not only that he has a displeased and noncooperative patient, but also that much time and physical energy have been spent unprofitably.

CONCLUSION

I recognize the good that may be accomplished by increasing the vertical maxillomandibular dimension in carefully selected cases, and, in the light of our present knowledge, a conscientious consideration of the physical welfare of our patient may indicate the necessity of a change in the maxillomandibular relation. In other cases, the esthetic value of increasing the vertical dimension of the face may justify the operative procedure.

Extreme measures, and bite opening *is* an extreme measure, are always justified when necessary to relieve physical suffering and at times may be justified for esthetic purposes. We must, however, carefully weigh the factors herein considered which might tend to contraindicate the procedure for the case under consideration.

Whenever we discuss changes of the maxillomandibular relation as a procedure which should be introduced into general dental practice, we must accompany our remarks with words of warning and advocate discretion.

Although carefully selecting his cases for "bite opening" with the health factor primarily in mind, the dentist must possess more than the usual understanding of the biologic and the mechanical factors involved, recognizing the complications incidental to these changes and the dangers of increasing or causing physical suffering.

In addition to vision and judgment, one should have special training in this complicated type of dental practice to enable him to properly form and coordinate all parts involved in completing a new dental mechanism.

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ESTHETIC TREATMENT OF AN ADULT CASE OF CLASS I MALOCCLUSION

By George S. Harris,* D.D.S., M.S., Detroit, Mich.

HISTORY.—A man, aged 29 years and 7 months, presented himself for treatment at the Department of Orthodontics of the College of Dentistry of the University of Michigan in January 1938. The case was primarily one of improving the appearance, involving the treatment of spaced maxillary central incisors and the restoration of maxillary peg lateral incisors with porcelain jacket crowns after their orthodontic treatment. There was no family history of a similar condition. There was no history of habits which might have contributed to the deformity, although a compensatory habit—that of hiding the maxillary anterior teeth with the upper lip—was present. The frenum was normal. The patient was a concert and radio singer and his dental deformity was a distinct handicap in his profession.

Fig. 1.—Case before treatment; intra-oral photograph taken January 14, 1938.

Classification and Diagnosis.—The case was a Class I (Bennett and Angle), with the maxillary central incisors spaced 2.4 mm. The maxillary right central incisor was inclined distally, and its mesial surface was 2.4 mm. from the midline. As the maxillary left central incisor was apparently in correct position, the spacing was evidently a result of the distoversion of the right central incisor. The maxillary lateral incisors were peg-shaped and were mesially tipped, so that the sloping mesial surfaces of the peg teeth were in contact with the distal surfaces of the central incisors. This situation made large triangular spaces between the peg-shaped lateral incisors and the canines. The tipping was evidently caused by the occlusion of the incisal tips of the mandibular canines with the distal surfaces of the maxillary lateral incisors. (Figs. 1-3.) As a result of these abnormalities of tooth structure and position, the patient's smile revealed three large spaces in the upper anterior region, in addition to the disfiguring appearance of peg lateral incisors. The compensatory mechanism for covering the disfigurement—viz., con-

Fig. 2.—Case before treatment; casts of January 1938.

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stant holding of the upper lip over the upper anterior teeth, was successful except during laughter. (Fig. 4.) The mandibular anterior teeth were crowded. The maxillary second molars were abnormally tipped buccally. Three third molars were impacted, and the fourth, although erupted, was beyond repair. The general condition of the posterior teeth

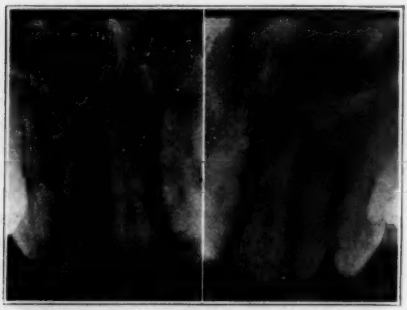

Fig. 3.—Case before treatment; radiograms of maxillary anterior teeth taken in January 1938.

Fig. 4.—Case before treatment; photograph taken January 14, 1938.

was poor. Although bridgework was not present, there were multiple large restorations, some of which were in bad condition. Radiograms showed six root-canal fillings, all in the posterior teeth. There was no radiographic evidence of periapical disease of the teeth with root canals filled. No teeth had been lost.

Treatment.—Because of the age of the patient and the poor condition of the posterior teeth, treatment other than that of a compromise nature seemed contra-indicated. All third molars were extracted.

After complete records had been made, bands were constructed for the maxillary first molars. A 0.038 inch maxillary lingual

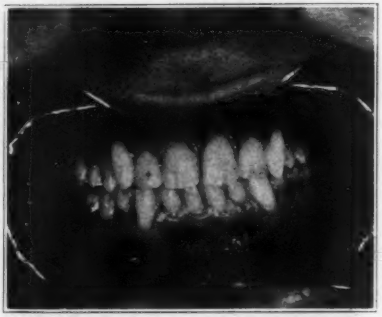

Fig. 5.—Completed case; intra-oral photograph taken June 3, 1938.

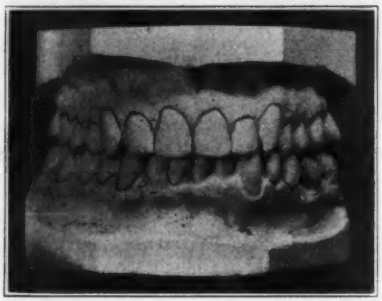

Fig. 6.—Completed case; casts of June 1938.

arch was attached to the molar bands by means of half round tubes and shafts. A 0.020 inch auxiliary spring, acting to give mesial stress to the maxillary right central incisor, was attached to the lingual arch. This appliance was adjusted regularly, but a movement of only 0.1 mm. resulted in two months. At that time, it was abandoned in favor of a pin and tube appliance.

Both maxillary central incisors and the maxillary left canine were banded. Three-sixteenths inch horizontal round tubes made to take 0.022 inch wire were soldered on the labial surfaces of the central incisor bands in such a manner as to allow a 0.022 inch pin to slide freely through them. The maxillary left central incisor was stabilized by a 0.03 inch wire extending from the disto-labial portion of its band to the left maxillary canine band. This wire was soldered to the bands, thus giving stabilization.

The maxillary central incisors were then ligated with a silk ligature applied in a figure 8 to the distal ends of the labial 0.022

Fig. 7.—Completed case; photograph taken June 3, 1938.

inch horizontal round tubes with the pin in place. Ligatures were changed every ten days. In this manner, the space between the maxillary central incisors was closed in three and a half months, almost entirely by the mesial movement of the right central incisor. There was a slight reaction upon the left central. Movement was guided in the desired direction and rotation was avoided by the use of the guiding pin and tubes. The left central incisor was adequately stabilized throughout the treatment.

Actual contact between the central incisors was established by readapting the central bands to fit the incisal one-third of the teeth, trimming them to one-sixteenth inch in width on the mesial borders, refitting the stabilizing wire and moving the teeth into contact by the use of silk ligature. The axial inclinations and crown positions of the maxillary peg lateral incisors were corrected by means of auxiliary springs from the lingual arch wire during the time the central space was being closed in the manner described above. It was necessary to grind down the mandibular canines to allow space for the correct positioning of the maxillary peg lateral incisors. Check-up radiograms of the teeth being moved were made from time to time.

After the peg lateral incisors had been moved to occupy the central portions of

Fig. 8.—Completed case; radiograms of maxillary anterior teeth taken in June 1938.

their respective spaces, spurs from the lingual arch wire were used for retention during the porcelain jacket crown preparations. The porcelain jackets were made by a cooperating general practitioner.

The central incisors were retained in contact by means of a steel ligature, which was removed only while the impressions for the jacket crowns were being taken. When the maxillary right lateral porcelain jacket was cemented, retention of the maxillary right central incisor was established. The last step was the cementing of the maxillary left lateral porcelain jacket and the removal of all appliances.

The case was completed in June 1938, after five and a half months of active treatment, retention being gained from the increased mesiodistal dimensions of the por-

celain jacket crowns over the peg lateral incisors. Final radiograms showed excellent tissue condition and no root resorption.

Prognosis.—The prognosis is good inasmuch as adequate retention by the porcelain jacket crowns should eliminate the possibility of relapse. All leaking and broken down fillings in the entire mouth were replaced and all new cavities were filled. One root canal filling and one Richmond crown were necessary. The patient was warned of the importance of keeping all of the teeth in excellent condition.

The esthetic result in this case has had a markedly beneficial effect upon the personality of the patient, who for years had been attempting to hide and compensate for his deformity. The final result is shown in Figures 5-8.

1802 David Whitney Building.

SHOULDERLESS PORCELAIN JACKET CROWNS WITH REINFORCED PLATINUM MATRIX

By Daniel Staples Gardner, D.D.S., Scranton, Pa.

RESTORATION of lost tooth structure by means of the shoulderless porcelain jacket crown is not new to American dentists. W. A. Capon, of Philadelphia, along with others, introduced these crowns prior to the time when I began practice, in 1902. As the shoulderless type was not generally used on account of breakage under stress, it was easily replaced by the shoulder porcelain jacket crown. Some of these pioneers in making jacket crowns experimented with each type and concluded that the shoulder porcelain jacket crown had greater strength and durability. However, after years of observation and experimentation, which included many disappointments, I have overcome the obstacles present and believe that the strength and durability of the shoulderless porcelain jacket crown is as great, if the platinum matrix is properly reinforced.

The shoulderless porcelain jacket crown serves a twofold purpose: 1. It affords the ideal restoration for badly decayed teeth when the crown is completely destroyed with the exception of a small portion of the tooth showing above the gingival margin. (Fig. 1.) Prior to the advent of the jacket crown, this type of tooth had to be restored with a pivot or a Richmond crown, which necessitated devitalization of the pulp. The shoulderless porcelain jacket crown with the platinum matrix reinforced solves this problem by maintaining the vitality of the pulp and restoring the tooth to its original appearance. (Fig. 2.) 2. Its use prevents the careless cutting of tooth structure, which frequently occurs in trying to form a shoulder in order to give the desired strength to the porcelain. The destruction of the pulp due to this type of restoration is more likely to occur in the preparation of small teeth such as upper lateral incisors, lower incisors or teeth with excessive convexity. (Fig. 3.)

Pulps have been found dead under shoulder porcelain jacket crowns that have been in place for a number of years, and here, for some reason, it was necessary to replace them by a new crown. The patients were not aware of the hidden infection nor would the condition

Read at the fourteenth Greater New York Dental Meeting, December 8, 1938.

have been known if the jacket had remained in place. The fact that a pulp is dead is never revealed by the x-rays. Even under large fillings or inlays, the pulp may die if not properly protected.

Since porcelain is the best nonconductor of heat, cold and electricity, it is the ideal means of protection for the pulp, the vitality of which should be the aim of all dental practitioners. Extreme care should always be protected between appointments. Otherwise, infection may reach the pulp through the dental tubuli; which may cause continued irritation and may result in the death of the pulp.

Please do not understand that I consider all teeth should be prepared without shoulders: shoulder porcelain jacket crowns have their value and place in restorations. They are ideal under many conditions, yet if equally good results can be obtained by less cutting of sound tooth structure, the desired strength being secured and the normal health of the gingival tissue maintained, this method should command our attention. (Figs. 4-5.)

Fig. 1.—Appearance of upper left lateral incisor after gingiva was cut away for about 2 mm. The tooth had been restored with a large gold inlay, which was in service for a number of years and finally fractured to the labiogingival margin. The pulp, which had receded, was vital. The patient was 56.

Fig. 2.—Appearance of reinforced shoulderless porcelain jacket crown on left lateral incisor one month after cementation.

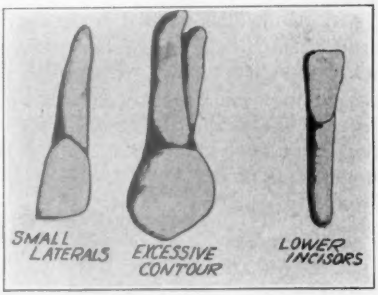

Fig. 3.—Types of teeth in which destruction of pulp is likely to occur during preparation for restoration.

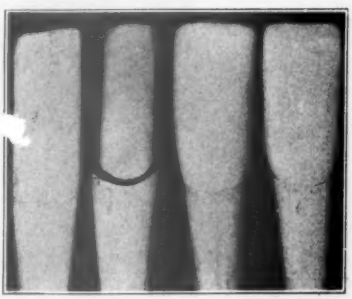

Fig. 4.—Comparative amount of cutting needed to prepare both shoulderless and shoulder crown and appearance when restoration is finished.

should be used in preparing a tooth for a porcelain jacket crown because destruction is inevitable if, during the preparation, excessive heat is produced or cutting extends too near the pulp. During the preparation for crowns or in other restorations, the dentin, if exposed,

The ability to do laboratory work is most important in making porcelain jacket crowns, but many men will not take the time to train themselves in this technic, depending on the commercial laboratory technician who prefers making shoulder porcelain jacket crowns and discourages the use of shoulderless porcelain crowns because of the extra work and expense required to reinforce the platinum matrix in making them.

Any dentist who does not possess an electric furnace is practicing under a heavy handicap. This is one reason why so many become discouraged with this type of work. It requires only a short time to alter shades if one has the proper equipment. Then too, when it is necessary to grind a contact point, it should be reglazed before cementing. Grinding porcelain with a carborundum stone should be done under a blast of air to prevent any of the carborundum being forced into the pores of the porcelain, which will interfere with the glazing of the surface. A rough surface will wear a contact point of an adjacent tooth, especially where it comes in contact with gold, if it is not reglazed. If one does not have a furnace, he may neglect this important step rather than send the crown back to the laboratory for reglazing.

The question arises in my mind as to why a young dentist who is anxious to be busy should just prepare a tooth and take the impression and then sit around and wait until the laboratory technician has made the jacket crown. This would not be the case if he were eager to train himself to complete the crown in his own office. This training cannot be acquired in the dental schools. It takes hours of practice in one's laboratory. Many men give little thought to having a well-equipped laboratory; which, in my opinion, is a great mistake if we wish to render the best service to our patients.

PREPARATION

Shoulderless porcelain jacket crowns can be made on any tooth in the mouth if it is possible to fit a copper band.

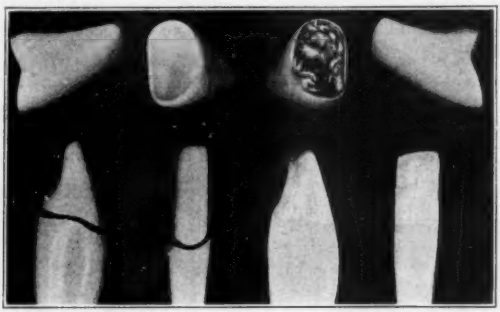

Fig. 5.—Jacket crowns removed from models, showing platinum matrix inside shoulderless crown.

It makes no difference how badly a tooth is decayed or what the number of undercuts in the crown of the tooth just so the convexity is removed and the band fits the root about 1 mm. under the gingivae. We are not dependent on having the compound make a perfect impression, but on an accurate fit and the use of a festooned copper band under the cervical margin. Any dentist who can properly prepare a tooth for a gold crown can use the same technic for the prep-

aration of a shoulderless porcelain jacket crown. In each case, the convexity of the tooth must be removed. It is necessary to remove more of both the occlusal and incisal surfaces to allow for bulk of porcelain, which adds to its strength. The proper preparation of the tooth is most important if we hope to be successful. Many failures are due to faulty preparation, and the shoulderless porcelain jacket crowns are condemned, when the fault is the operator's.

In beginning the preparation, the pulp should be protected by sterilizing the dentin with phenol and applying a suitable varnish or pulp lining, and all cavities should be filled with cement. It is not imperative that all depressions be

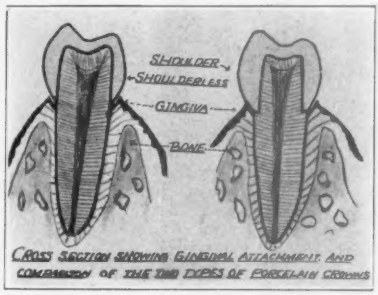

Fig. 6.—Gingival attachment and types of porcelain crowns.

filled as in the case of a shoulder porcelain crown.

A standardized technic is an aid to speed and accuracy. The instruments to be used in the preparation must be suitable to each case, suitability depending largely on the location, shape and size of the tooth. This selectivity is acquired by practice. As each instrument is selected, the work with that particular one should be completed before using another.

If the Jo Dandy disk is used to cut between the teeth, it must be used with care; otherwise, it will destroy the contact point of the adjacent tooth and form a shoulder on the tooth being prepared that will interfere with construction of the shoulderless porcelain crown. It is better to use the safe-sided lightening

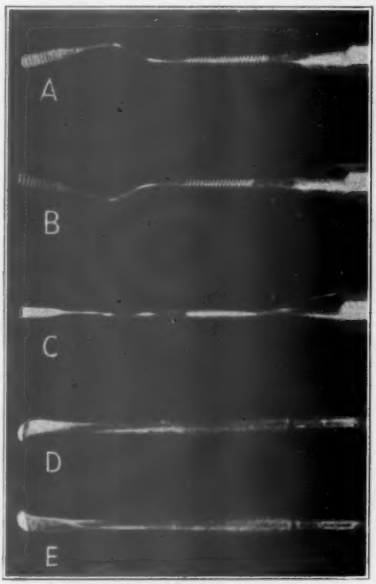

Fig. 7.—Instruments used in removing enamel at cervical margin. A and B files. C, scaler, Waktassi. D and E, enamel cleavers, Cleve-Dent 1 and 2.

Fig. 8.—Festooned copper band in position on tooth 1 mm. under free margin of gum.

disk, which should be held in such a manner as to be under control at all times. This is a dangerous instrument

in the hand of a careless operator as considerable harm may be done to the soft tissues. A major part of the preparation can be completed by rotating this disk around the tooth and keeping it wet to prevent excessive heat.

Sufficient space plus the thickness of the platinum must be allowed between the teeth without cutting near the horn of the pulp, to obtain the desired strength of the porcelain. Since the original shape of the tooth must be maintained as far as possible, it is not necessary to remove all the enamel if it does not interfere with the fitting of the copper band under the gingiva. The use of a coarse stone is effective in reducing the incisal and occlusal surfaces. It cuts very fast and so must be kept wet. It is essential to cut slightly more than one would for a gold crown, but no more tooth structure should be sacrificed than is absolutely necessary. The Popper stones have given me the best service for general use, as they cut rapidly and retain their shape the longest if kept wet or run in oil or vaseline.

I consider the most important step in the preparation of the shoulderless porcelain jacket crown to be the removing of the enamel at the cervical margin and the planing of the root surface under the gingiva. Care must be taken that the epithelial attachment not be destroyed. (Fig. 6.) Enamel cleavers, scalers and files are used for this purpose. (Fig. 7.) At this point, we must obtain an accurate fit so as to restore the natural contour of the enamel, slightly exaggerated in the finished crown. This slightly exaggerated contour, however, does not irritate or otherwise affect the normal gingival tissue. Many disappointments have been encountered owing to failure to restore the contour at the cemento-enamel junction. Should one fail in preparation, one cannot hope to be successful in constructing a porcelain jacket crown, and more time will be sacrificed in the end; which is true of all dental operations.

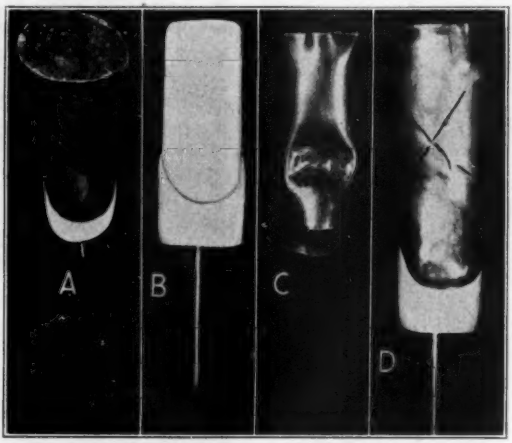

Fig. 9.—A, X marked on copper band to determine labial surface. B, false shoulder made on kryptex or amalgam die which determines margin to which crown is to be constructed. C, band pushed in on lingual surface to act as stop in taking impression. D, band in position on die.

CONSTRUCTION OF THE CROWN

With the preparation completed, a 36-

gage Blue Island copper band slightly smaller than the tooth at the cervical margin is selected. Heating this band to a red heat and plunging in alcohol makes it soft and, with the aid of stretching pliers No. 130, it is easily adapted to the root, being made to fit closely—a point not to be overlooked. It is festooned in conformity to the position of the gum and should be at least 1 mm. under its free margin. (Fig. 8.)

At this time, the band is carried to the band and the tooth at the cervical margin if it fits properly. With the band and compound in position, a sectional impression with either plaster or compound is taken. (Fig. 10.) After the bite is secured and the exposed dentin protected, the patient is given another appointment. If the patient objects to the appearance of the prepared tooth, a temporary crown may be used. However, with a shoulder porcelain jacket crown, it is imperative that a temporary crown

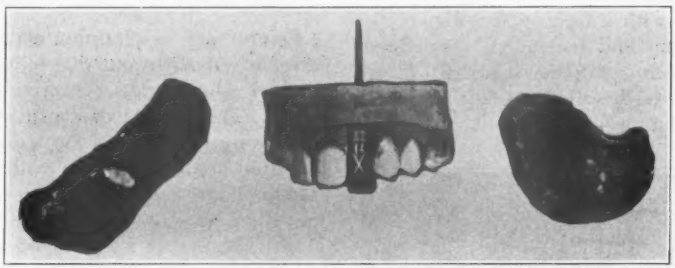

Fig. 10.—Sectional impression with compound, and model run in artificial stone.

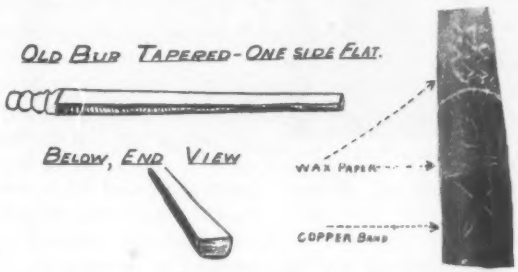

Fig. 11.—Shoulderless porcelain jacket crown technic.

position on the tooth and pressed against some surface that will act as a stop while the impression is taken. (Fig. 9c.) It is filled with modeling compound and carried to position on the tooth and worked up and down while the compound is soft, and thus any depressions are ironed out. It is now removed and any rough surfaces are smoothed, as these interfere with fitting the platinum matrix on the die. There will be no compound between be made to keep the gum away from the shoulder; otherwise, it will interfere with the finished crown going to place.

Though different materials such as amalgam, "dia-lock" or artificial stone may be used to make a die, kryptex is my preference, for, if it is mixed correctly, the die can be completed in less than ten minutes. The kryptex die should be kept in oil to prevent shrinkage; otherwise, owing to the slight shrinkage

of the die, it might cause a fracture of the porcelain while the crown is being fitted. There is slight expansion with "dia-lock" material. When making shoulder porcelain jacket crowns, my preference for the dies is amalgam, as it does not fracture when the platinum is burnished over its shoulder; whereas the kryptex is not sufficiently hard for this purpose and the probabilities are that it will fracture at the edge. With the shoulderless porcelain jacket crown, the copper band with the impression is wrapped with waxed paper (Fig. 11) or cellophane and extended about one-fourth inch above the band. It should fit closely to the band so that the kryptex will not run over its edge.

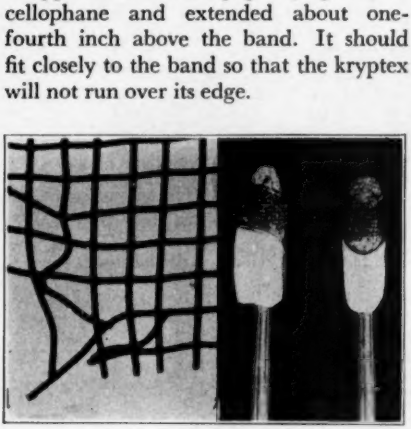

Fig. 12.—Photomicrograph of platinum mesh and mesh in position on platinum matrix.

A metal pin is made from an old bur flattened by grinding on one side to retain its position in the model and to serve as a handle while making the crown. (Fig. 11.) Prior to removal of the kryptex from the band and impression, it is trimmed to the edge and assembled in the sectional impression. Soft wax is placed around the exposed part of the die up to the pin, and the model is run with artificial stone. (Fig. 10.) If care is taken to restore the contact point, the jacket will go to place without reglazing after it is completed. The impression is taken of the opposing teeth with modeling compound, a stone model is run and a wax guide is made to give an accurate bite in centric occlusion. These are mounted on an articulator. The die is removed from the copper band and impression and is ready for the platinum matrix. The imprint of the band gives a slight shoulder on the die, which is the margin where the crown is to terminate. (Fig. 8.)

REINFORCING THE PLATINUM MATRIX

Reinforcing the platinum matrix is the secret of strength and durability of the finished shoulderless porcelain jacket crown. The manner of construction depends on the stress of occlusion. The platinum matrix is made with 1/1000 soft platinum and is similar to those for the shoulder crown with the tinner's joint. The matrix is burnished carefully to the false shoulder made by the imprint of the copper band. There are several ways of reinforcing the platinum, depending on the occlusion and the direction of the force applied. If maximum strength is to be obtained, a soft round platinum wire, gage 24 to 30, depending on the occlusion and length of the tooth, is soldered around the platinum matrix at the cervical margin with 24-carat gold and ground in such a manner that the original contour of the enamel is reproduced. (Fig. 13.) The matrix is put in the furnace and brought to 2400° in order to drive off any gases before porcelain is applied. A platinum mesh (Fig. 12) is cut in strips and tacked around the matrix with 24-carat gold. The width depends on the strength desired. This mesh reinforces the porcelain as steel mesh reinforces concrete. Its use adds materially to the strength of the porcelain, thus preventing it from breaking away from the platinum matrix. The fusion temperature of the mesh, 3300° F., and the Brinell hardness, 10

per cent iridium, is equal to 220 hard worked and 150 annealed at 2100° F. The Brinell hardness pure platinum annealed is equal to 30. Platinum mesh is made only in 10 per cent iridium and is 52 mesh. Before I used this mesh, the porcelain under stress would break away from the platinum.

For anterior teeth, if we do not want the dark line of platinum to show at the cervical margin, a narrow strip of platinum 34 gage or soft round wire is soldered about 1 mm. away from the margin and the porcelain baked over this to the edge, thus hiding the platinum. (Fig. 13.) The platinum wire may be soldered around the cervical margin with the exception of the labial surface, where it is kept away at least 1 mm. and ground

Fig. 13.—Platinum wire soldered to platinum matrix.

thin, thus preventing it from showing through the porcelain. The mesh is always used where additional strength is needed. The 24-gage wire affords the greatest strength and should be used where the bite is close, especially for molar teeth. With the platinum matrix reinforced and placed on the model, we are ready for the porcelain.

The dentist who does his own laboratory work may make the matrix directly on the tooth in the mouth. Instead of fitting a copper band as has been explained, a soft platinum plate, gage 34 or 36, is used. A wire measurement of the tooth should be taken at the cervical margin and this band be tapered toward the incisal edge and soldered with 24-carat gold. This matrix is adapted to the tooth as one would adapt a band for a gold crown and is burnished to fit closely. To prevent porcelain breaking away from the platinum, a sharp pointed instrument may be used to roughen the matrix, or it may be reinforced with the platinum mesh where the bite requires greater strength. Care must be taken to secure an accurate fit at the cervical margin about 1 mm. under the gum. These crowns may be completed in one sitting if from any stock tooth a proper shade facing is selected, ground thin to fit against the platinum matrix and waxed to place. The platinum and facing are removed and invested with high heat investment and placed in the furnace at about 1400° to burn off the wax. It is removed from the furnace and high-fusing porcelain baked around the matrix and on the facing. After it is removed from the investment, it is completed with 1875° porcelain. This technic applies particularly to the anterior teeth, yet may be used on the premolars in certain cases.

SHADING

The selection of porcelain to be used to give the desired shade is a most difficult problem. Shading and matching teeth are almost a lifetime study. It

is necessary for each operator to train his eye in color matching. Buttons must be baked and studied under different lights and should be made from each jar of porcelain as it comes from the manufacturer, because rarely are any two jars identical in shade. It pays to make these buttons to test the shade before finishing the crown. Blending the shades may be done on these buttons, taking very little time. Opaque porcelain is used to hide the platinum matrix. Selecting this foundation color requires care; otherwise, it will interfere with the finished shade. Any shade of yellow may be had by selecting a dark yellow and adding different amounts of white. Different shades of gray are obtained by selecting a dark gray and adding different amounts of white. Other shades are obtained in like manner. If the platinum interferes with the shade, it may be ground out before cementing, and the color of cement selected may change the shade. The cement may be mixed with glycerine to test the shade before final cementation. Even though a strong durable restoration is obtained,

Fig. 14.—Shoulderless porcelain jacket crown on upper left central incisor.

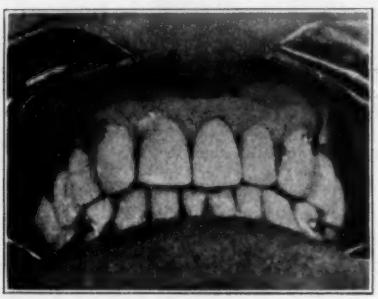

Fig. 15.—Upper left canine restored by shoulder porcelain jacket crown; upper left lateral incisor, by shoulderless jacket crown with platinum reinforced with round platinum wire; upper left central incisor, by Steele facing on partial denture; upper right central incisor and canine, by shoulderless porcelain jacket crowns with platinum reinforced with platinum mesh.

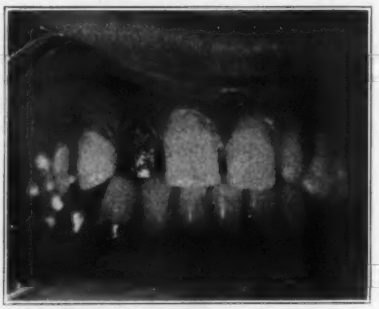

Fig. 16.—Reinforced platinum matrix on upper right lateral incisor.

Fig. 17.—Restoration of both upper lateral incisors shown in Figure 16, by means of reinforced shoulderless porcelain jacket crowns. The upper left lateral incisor was stained.

the patient will never be satisfied if the shade is "off." We are always ashamed of our work when one tooth stands out in contrast with others. It is necessary for the dentist to learn to *think* colors in order to obtain the best results.

MANIPULATION OF PORCELAIN

The manipulation of porcelain is rather simple if we remember two fundamental principles: 1. After the porcelain is mixed with water, the air bubbles must be eliminated by vibrating thoroughly and allowing to stand before applying the porcelain to the platinum matrix. 2. The water is drawn through the porcelain after it is applied to the matrix, condensing similarly to water running over and through the sand at the seashore, making it dense and firm.

Forms can be made with heavy tin or cellophane wrapped around the matrix, the porcelain vibrated to place and the water drawn out with blotting paper. It is a little more difficult to control the shades by this method. By proper condensation, shrinkage can be reduced to a minimum. Jackets can be made with one baking, though it usually requires from two to three for completion. A reinforced shoulderless porcelain jacket crown may be worn several days without permanent cement in order to give one the opportunity to study the shade, which, if not satisfactory, can be changed with low-fusing porcelain. Should the porcelain fracture, it can readily be repaired before cementing. This cannot be done satisfactorily with a shoulder crown.

CEMENTATION

Many restorations are ruined by careless cementation. The tooth should be sterilized with phenol and painted with a solution of rosin, thymol and an antiseptic dissolved in chloroform. The zinc phosphate cement is carefully mixed to a creamy consistency and the tooth covered with the cement. The jacket should be completely filled with the cement to avoid trapping air under the crown. The crown, held to place with an orangewood stick and vibrated with a rough instrument, is properly seated. After the cement has hardened for at least ten minutes, the gingival tissue is held away with the aid of compressed air and, with a suitable instrument, the excess cement is completely removed. Should any of the cement remain around the margin, it will be a constant irritant to the gum. The illustrated cases show the appearance of the shoulderless porcelain jacket crowns and the health of the gingival tissues. (Figs. 14, 15, 16, 17.)

CONCLUSION

Porcelain offers unlimited opportunities for restoring lost tooth structure. The dentist who does not avail himself of the opportunity to construct porcelain jacket crowns misses an enjoyment in his practice that cannot be obtained in any other way. In beginning my paper, I mentioned that I did not wish to convey the impression of condemning the shoulder porcelain jacket crown or of holding the opinion that all teeth, when a crown is necessary, should be restored with the shoulderless porcelain jacket type. I know from my own experience that the two types of crowns are equally important to the profession, but where the vitality of the pulp is involved, I do favor the shoulderless porcelain jacket crown.

Medical Arts Building.

FIXED BRIDGES: THEIR MAINTENANCE

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AMONG the many factors involved in fixed partial denture prosthesis, so-called fixed bridgework, none has received less consideration, yet none is more essential, than that which relates to the maintenance of this type of restoration. Much thought and effort are being daily devoted to the making of a correct diagnosis and to an accurate determination of existing oral conditions for those patients who are partially edentulous. Many valuable contributions have been made relating to the planning and construction of crowns and bridges. It would, therefore, seem to be more or less redundant at this time to discuss again fundamentals related to the preparation of teeth for bridge retainers, or to discuss in detail the construction of pontics or other mechanical features of restorations.

To deviate slightly, I should like to start with the premise that the condition of every partially edentulous mouth has been properly diagnosed, that the planning and construction have been correctly executed and that the appliance has been installed and finished in such a way that it meets all requirements—biologic and mechanical.

In such an ideal situation, it appears that there is little left to be desired, either from the patient's point of view or from that of the dentist. Yet many of us know from experience that not infrequently these apparently ideal and perfect prostheses return to us in a course of a few years in such a condition that not only are the function and anatomic form destroyed to a large extent, but frequently also other additional damage has been sustained by the teeth and tissues which were healthy and functioning when the bridge was installed. Unfortunately, many of these cases do not return to us after failure, and consequently we lose the opportunity to study our failures.

Very frequently, some minute, unobserved, yet basically vital, factor escapes attention at the time the appliance is placed. The condition may grow progressively worse, and unless we have the opportunity of examining a bridge at regular intervals, the damage to it may become so extensive by the time the patient sees us that it is irreparable. It is routine procedure with many dentists to obtain complete mouth radiograms prior to the construction of crowns or fixed partial dentures. It is becoming a general practice for most operators to obtain an accurate set of study casts, in either plaster or stone. Many men also make it a routine procedure to record the profile of adult patients and the color of their teeth. These records are carefully filed away for future reference. Valuable as they are, their full significance is not grasped until they are used as standards for comparison with subsequent radiograms, records and models made at later periods.

It has been found extremely valuable to radiograph each supporting tooth immediately after the installation of every crown or fixed partial denture. This procedure enables one to verify the gin-

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gival fit or discloses any discrepancy which may have escaped a visual examination. It also discloses remnants of cement left unobserved. If this is permitted to remain, inflammatory processes usually result and sometimes there are serious sequelae.

If a patient is informed of the purpose of these steps; i.e., is told that they are taken as a check and as a precautionary measure, rarely, if ever, will he raise an objection to this additional service. On the contrary, it will help him to realize that the dentist is taking every possible measure available to insure the continuance of a satisfactory restoration.

This procedure, if followed regularly, starts every tooth that carries either a crown or a bridge retainer upon its prosthetic career with two definite radiographic records, one prior to and one following the reconstruction. If it is found that the prevailing conditions at the time that a bridge is set are satisfactory both clinically and radiographically, it is well to tell the patient that although the bridge is a mechanical appliance, it is also a part of their biologic entity and that changes may occur in existing biologic relations. For this reason, we try to impress each patient with the need and importance of subsequent radiograms taken at periodic intervals following the installation of the appliance. This is particularly true if the supporting tooth or root is pulpless.

It is our duty, I believe, to point out to patients that changes can and do occur, with respect not only to an individual tooth present in the mouth, but also to a group of teeth. Sometimes, these changes may be due to normal processes accompanying normal functions, and ordinarily there are no deleterious results. On the other hand, slight changes may cause a harmful reaction and, unless recognized and corrected in their early stages, may result in serious damage.

Frequently, we must decide upon the retention or extraction of a tooth because of suspected or questionable periapical areas. If complete previous periodic clinical and radiographic records show by comparison that an existing questionable root condition is in reality one in the process of regeneration and repair, rather than in the initial stages of degeneration and destruction, the tooth is retained.

The interval between periods for radiographic examinations is determined to a large extent by the condition and type of supporting teeth, the type and extent of the restoration, the habits and health of the patient and possibly the type of occlusion present. In every case, however, a definite date should be designated for the subsequent radiographic examination. If the patient is convinced that this procedure is more than mere routine accompanying regular semiannual prophylaxis, it is quite likely that this procedure will be regarded as part of a preventive and maintenance service. While radiographic interpretation is rather questionable and personal, one can usually establish a norm for osseous and periodontal tissues. It is then possible to make comparisons of the bone as to its structural form, resorption or calcification. These observations can be extended further to designate either the gingival, middle and periapical thirds, or the entire length. The same is true of the peridental membrane. Since the age of the patient is known and the degree of function of any particular tooth may be determined, one is enabled to judge whether the peridental membrane is normal or is excessively thickened, or whether any pathologic process exists. If radiograms taken periodically over a period of years are available, the task of detecting any changes that may have occurred and of evaluating more accurately the type and degree of such changes is simplified.

One other factor which enters into the maintenance of fixed partial dentures

deals with the dynamic examination. All dentists, no doubt, have observed that patients differ as to the strength of the bite. It has been found that, on the average, the force of the bite which men are capable of exerting far exceeds that of women. We also are aware that the strength of the bite decreases from the posterior teeth anteriorly. It has been observed and reported that when a mouth becomes partially edentulous, the average force exerted is reduced in proportion to the number and the distribution of teeth lost.

A study initiated fifteen years ago, and still in the process of further analysis, shows a very encouraging reaction when missing teeth are replaced with fixed partial dentures. In these cases, which have been checked periodically both clinically and radiographically, a gradual development of powers of resistance to increased loads of mastication has been seen. These patients may exert forces which increase every year, until finally a point is reached just below what might be considered the available efficiency peak for that individual.

For the purpose of studying dynamic tabulations, a gnathodynamometer, an instrument which records the bite in pounds, is used. The bite is first taken on the tooth carrying the bridge and then on the corresponding tooth in the other segment of the arch. If it is a two abutment fixed partial denture, the force determinations are made on each of the abutment teeth as well as on their mates in the opposite segment of the arch. It has been found that, in obtaining this record, it is not the musculature, but rather the sensitiveness and the tolerance of the peridental membrane, which is the determining factor. When patients return at six-month intervals, it has been found that, after the first year, all teeth being sound and the tissues in a healthy state, there is a definite increase in the pressure tolerance of the peridental membrane; also that where teeth previously were functionless or of a very limited function, in the course of a few years there was not only a definite and pronounced increase in the load tolerance, but also a discernible change in the trabeculation of the supporting bone.

A very interesting observation may be made with reference to the thickness of the peridental membrane and the relative function of a tooth. As has been pointed out by others, a tooth in function has a relatively wider peridental membrane than one out of function. Clinically, it has been observed that a tooth out of function or with function greatly reduced may be quite immobile as compared to a normally functioning tooth; yet, in a comparison of their respective dynamic tabulations, the less mobile tooth is not capable of sustaining the same degree of pressure as the corresponding one with greater mobility. This important clinical factor should be established and supplemented by the radiograms. Where an instrument is available for taking dynamic records, it is good practice not only to determine the strength of the bite in corresponding teeth in the other segment of the same arch, but also to make a comparison of the forces in the entire restored segment with those in the other segment of the arch. A problem in research is disclosed for those who wish to correlate dynamic clinical tabulations with the corresponding radiographic findings.

In addition to making a complete radiographic and dynamic examination upon the completion of a restoration, it is advisable at the time to determine and record the general health of the patient, also the oral health conditions. It should be routine practice also to classify the patient with reference to susceptibility to caries. During a periodic clinical examination, it is well to make a detailed study of the condition of each crown and retainer from the point of view of caries, and also from the point of view of the pulp.

It is well to determine the pulp vitality of every tooth carrying a crown or bridge retainer at the time the patient is dismissed. This should be done not only by radiographic evidence, but also by electrical and thermal tests. This step is equally important in subsequent periodic examinations. Our findings should be accurately recorded as to date and degree of response to these tests. To make our maintenance records complete, we should carefully check the condition of the investing soft tissues. When patients return at stated intervals, it is well to check the condition of the ridges underlying pontics. Is there evidence of inflammatory processes? If so, it is well to determine the causes and correct them. If recession of the ridges has occurred, a decision must be made as to whether new porcelain is to be added to the pontics immediately or at a subsequent time. Possibly, hypertrophy of the tissues has permitted an unsanitary condition to develop, in which case it may be necessary to modify the porcelain member of the bridge, or even remake the entire bridge. In all instances, when patients return semi-annually, it is advisable to take impressions annually of both arches, construct study casts and make comparative studies in the occlusal relations of the two casts. It is not unusual to detect a shifting or a dislocation of a tooth which may be due entirely to the presence of a misplaced or a miscontoured contact point. Such an annual comparative study very frequently discloses occlusal disharmony which has developed since the restoration was made or since the last set of casts were made.

The presence and the degree of abrasion may also be determined and methods be decided upon to rectify the condition. If it is found that there are certain points of occlusal interference which need adjustment, the amount may be determined and the adjustment be made before extensive periodontal destruction occurs. After these observations, any necessary corrections should be carefully recorded on the patient's chart and the service so rendered at the time should be explained to the patient. Most patients will appreciate a corrective and preventive maintenance service of this character. The date for the subsequent examination is very often determined by the conditions which are disclosed during the clinical examination. When it is found necessary to make adjustments, particularly removing offending points or surfaces to correct occlusal relationship, it should be a matter of rule as well as precaution that all ground surfaces be polished or finished to the degree of the original polish. If it is found necessary to grind natural teeth, these likewise should be highly polished to avoid not only discomfort, but also the possibility of caries.

Before dismissal, it is well to instruct the patient regarding the use and care of the crown or fixed partial denture. One should, in a broad, general way, advise the patient as to what service he may expect, the limitations of the use of an artificial appliance and the care which is expected of him in the maintenance of that appliance in a usable and healthy state. It is well to point out that certain symptoms may develop as a result of changes in the supporting tissues.

Finally, it is well to indicate just what the dentist can do to maintain the usefulness of a crown or fixed partial denture, provided he has the cooperation of the patient. It scarcely seems necessary to speak of this, but certain patients spend considerable sums of money on their teeth, and still are uninformed as to their duties in keeping appliances in a clean condition. This may be done by demonstration and careful subsequent checks of the patient's mouth.

One of the valuable assets of such a program of maintenance and follow-up service is a sustained interest in dental care and in the patient contact which is maintained. It should be as much a

matter of duty and pride to maintain dental restorations in a healthy and serviceable state for a long period of time, as it is to carefully diagnose, and to plan and construct a biologically and mechanically acceptable fixed partial denture.

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ELECTROSURGERY: ITS POSSIBILITIES IN THE TREATMENT OF PERIODONTOCLASIA

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OF the several modalities of electrosurgery in use at present, electrocoagulation is probably the best known. The adaptation of electrocoagulation for treating periodontal diseases was an evolution from its usage in medicine and surgery.

The results attained through its use for the destruction of carbuncles, cancer of the tongue, etc., attracted the attention of G. Farrell Webb,[1] who first applied this type of electrosurgery to the treatment of periodontoclasia. W. A. Beatty[2] also had been working along this line of application, for several years and without giving publicity to his experimentation.

The use of a high frequency current for producing coagulation is an improvement over the older use of chemical cautery in dentistry. For this purpose, phenol, silver nitrate, trichloracetic acid and other mineral acids were formerly used. The epithelium was involuted by this method of coagulation, tissues turned white or gray and sloughing occurred in a few days. Coagulation obtained by use of high frequency current is similar to coagulation produced by the use of mineral acids, but this modality permits of a larger and better controlled basis. Recent trends might indicate that coagulation is still in the experimental stage. Some of the first users have discarded this type of electrosurgery for desiccation and electrosection or the electric cutting current. This change of type of electrosurgery may lead to a more rational and ideal modality for the treatment of periodontoclasia.

William Gilbert (1540-1603), physician to Queen Elizabeth, in his experiments with electricity and magnetism for surgical use, became the originator of electrosurgery. Apparently, the first idea of what is known as coagulation was developed by Doyen,[3] in 1907. By his coagulation technic, he raised the temperature at the surface of the tissues to 900°. Doyen obtained a penetration depth of from 6 to 8 cubic millimeters, according to the size of the electrode. In 1910, William L. Clark,[4] of Philadelphia, continued his investigation in this field, which earned for him the title "Progenitor of American Electrosurgery." The credit for first using electrosection for the elimination of the pyorrhea pocket is due Joseph A. Hopkins,[5] of Rockford, Ill., who demonstrated this method at the Chicago Centennial Congress in 1933. In 1937, Edgar Chapman,[6] of Minneapolis, using a fine needle point for an electrode, applied the cut-

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ting current in a different manner. The technic consists of breaking down the pocket by scooping out the detached tissue rather than by eliminating it by incision. In 1935, using a bipolar electrode, Webb made the first contribution on what is strictly a coagulation technic.

Physics.—This modality of electrocoagulation is produced by the high frequency current delivered by a machine of this type. A high frequency current is an alternating current that consists of oscillations of extreme frequency, a million or more per second. When applied to the human tissues within limits of physiologic toleration, its action differs from that of all other forms of electricity, principally through the absence of sensory or motor effects. The extremely rapid alternation of the current precludes the development of electrochemical reactions, on which the polarity action and neuromuscular effects of the low tension high frequency currents are based. High frequency currents consist of a condensing system, whereby the current is forced through spark gaps. When the pressure of the current builds up capacity pressure in the condensor, the current surges back and forth between the spark gaps.

A brief classification of diathermy and the histologic changes that result is of interest in the study of this modality.

Classification of Surgical Diathermy.—The term surgical diathermy signifies the raising of the temperature of living tissue beyond physiologic limits by high frequency current. The extent and depth of destruction depend on the type of current and on the technic of application. There may be a simple drying of tissue on the surface, a fine coagulation along a line of instantaneous division or a massive coagulation to any depth.

Electrocoagulation.—Coagulation is obtained by passing the high frequency current with the aid of the monopolar or bipolar electrode through living tissues. With appropriate strength of current, coagulation of cell protoplasm takes place under the active electrode. A grayish white discoloration of a varying depth follows coagulation clinically. Histologically, the outline of the cell is entirely lost; the affected tissue elements become fused in a structureless homogeneous mass presenting an appearance not unlike that of hyalinization. This greater degree of destruction results in a greater amount of fibrous tissue formation.

Electrodesiccation.—A needle point electrode is connected to the high voltage terminal and held in contact with, or at a slight sparking distance from, the area to be treated. With proper strength of current, drying and shrinkage of the parts occur, being due to evaporation of the water contents of the cell. Following electrodesiccation, histologic examination shows the tissue cells shrunken and shriveled, their nuclei enclosed and elongated with a suggestion of cell outline; the whole assuming a mummified appearance. The blood vessels are thrombosed and there is no evidence of hemorrhage. Since this mode of cell death is associated with very little degenerative change and scant disintegration, only a small amount of fibrous tissue forms as an end-result. This explains the good cosmetic results, which are due to the fact that the neighboring healthy tissues are spared the devitalization resulting from the formation of abundant contractile fibrous tissue.

High Frequency Cutting Current.—A needle point, loop or blade is connected with the terminal of an apparatus producing a current of undamped oscillations. A dispersive electrode applied to the tissue will bring about rapid dissection owing to the molecular dissipation along the line of application. Following the use of the current histologically, there is a fine line of molecular decomposition, appearing as carbonization, beneath which there is a fine line of coagulation

and desiccation, resulting from the heat developed. The width of the zones is about 0.1 mm. when the average cutting strength is employed.

The findings of Clark and his co-workers on tissue changes following surgical diathermy are interesting. Guinea-pigs and rabbits were used for experimentation. Small areas of skin, subcutaneous tissue and muscle were dissected and coagulated and the animals returned to their cages. Several days later, sections were removed for study. They showed practically the same tissue changes already noted, but, in addition, there was round-cell infiltration in the outlying zones, and in certain areas this infiltration was localized around the blood vessels. In addition to the dissection or coagulation of the area immediately attached and the sealing of the lymph and blood vessels, the heat of the high frequency current undoubtedly penetrates beyond the totally destroyed tissue. It has been observed clinically that malignant cells, especially those that are differentiated, are devitalized at a lower degree of heat than are the normal cells. It is their claim that surgical diathermy lessens the likelihood of recurring metastasis.

A phenomenon recently observed by physicians practicing electrotherapeutics is the occurrence of a reaction similar to that of an autogenous vaccine; also the action of the histiocyte, or so called "reticulo-endothelial cell," which is capable of phagocytosis.[7] The initiative process invokes the arrival of the polymorphonuclear leukocyte and lymphocyte. Balmer[8] suggests that the destruction of myriads of bacteria *in situ* has a reaction analogous to the autogenous vaccine reaction. Silvers[9] suggests a comparison between the action of the bacteriophages and filtrates and the reaction to electrocoagulation. While these observations have been made in the field of medicine, they have a similar application in the treatment of periodontoclasia. In its application in medicine and surgery, except in malignancies, the practice has become more general to destroy only superficial tissues. This vaccination has the effect of clearing up the infections in the tissues, and also aids in clearing up secondary infections.

The advantages of these electrosurgical methods are: (1) mimimum loss of tissue; (2) a resultant beneficial hyperemia; (3) a lessened sensitiveness of teeth; (4) a favorable prognosis for shallow or deep pockets; (5) ease of control; (6) adaptability of electrodes and sterile operations; (7) a minimum of granulation, and (8) absence of hemorrhage or swelling.

Electrocoagulation has other operative uses, such as removal of hypertrophied tissue, lengthening of exposed surfaces for three-quarter crowns, treatment of sensitive cervical areas and removal of third molar flaps, fibrous growths, tuberosities and irregularities of gum margins prior to bridge or denture construction.

The modalities of electrosurgery are most useful in treating periodontal disease, in the hands of the skilled and experienced operator, but equally dangerous in the hands of the uninitiated. Soft tissue and the bone can be destroyed beyond the depth of the pocket; teeth may be devitalized, and prolonged pain, tooth sensitiveness to biting stress, soft tissue proliferation and recurrence of the pocket may result.

PREOPERATIVE TREATMENT

When electrocoagulation was introduced, no preliminary treatment of the field of operation was advocated. In fact, preliminary instrumentation, scaling and polishing were said to be unnecessary. Shortly after the introduction of the treatment, G. R. Lundquist strongly advocated thorough prophylaxis before treatment was begun. Personal experience with both methods has convinced me that postoperative pain is greatly re-

duced and tissues heal more quickly, with less tendency to proliferation, if preoperative treatment is carried out first. Thorough prophylactic treatment, which may require several sittings, is begun. The patient is given a mouthwash, preferably hydrogen peroxide diluted with several parts of water, which is pumped vigorously between the teeth for several minutes, three or four times a day. If the membranes are susceptible to oxidizing mouthwashes, milder mouthwashes should be substituted. If clinical symptoms indicate a past history of Vincent's infection, smears are made to ascertain the number of fusiform bacilli and spirilla present. If these organisms are present in sufficient numbers, the case is treated as chronic Vincent's infection. If any doubt remains after several treatments, smears are taken again to determine the number of Vincent's organisms present.

Patients are instructed in the correct brushing technic and methods of stimulating interdental spaces. This should be done before a mirror and patients be instructed to use a mirror in their daily brushing and stimulating operations. Pockets and interdental spaces, particularly those around the posterior teeth, are incubation zones for all pathogenic bacteria. Instrumentation is directed at these places, not only for the removal of the irritating bits of calculus, but also to eliminate the incubation zones. Traumatogenic occlusion should be corrected by conservative grinding, with emphasis on "conservative." Final corrections are made after the surgical treatment has been completed. If the above-mentioned steps in preoperative treatment are followed closely, with full cooperation of the patient, a marked improvement of the gingival tissues will result. This procedure will greatly reduce the amount and depth of coagulation necessary to completely eradicate the pockets.

Full-mouth roentgenograms are made, not only as a diagnostic aid, but also as a guide to treatment. Webb suggests the use of a double film, processing one set for three and one-half minutes at 650 F. and the other for five minutes at the same temperature. This procedure reveals the densities of the hard and soft tissues to be removed, which can be further and more accurately determined by bitewing roentgenograms. The use of blunt probes around the entire circumference of the tooth will confirm pocket depth, location and interproximal involvement.

Anesthesia is necessary when several teeth are to be treated. Coagulation is usually painful and unpleasant to the sensitive individual, particularly the first experience. I find it good practice to employ anesthesia in all cases where several teeth are to be treated. When procaine is used, it is employed sparingly. A small quantity is injected apically to the pocket on the buccal and lingual surfaces. If the tissues are blanched by the solution, it is impossible to note the blanching caused by the coagulation. To avoid overcoagulation, care must be exercised in injecting the anesthetic. When the area is very small, and a single pocket is to be treated, the application of any topical anesthetic is sufficient.

Type of Machine.—Satisfactory work can be done with any of the smaller machines, regardless of the kind that is used. In the selection of a machine for this work, it is well to consider the types of surgical diathermy one wishes to employ. A number of the smaller machines provide only the desiccation and coagulation currents. Some of the smaller machines are built to provide the coagulation current with the addition of the cutting current, an ideal combination of all practical uses. Regardless of the kind used, the machine should be in perfect working order and thoroughly understood by the operator.

The use of the high frequency current

for desiccation, coagulation or electrosection should not be attempted until the operator is thoroughly familiar with the strength of the current and the depth of penetration that results. Experimental work is done on veal heads. The head is placed on the dispersive electrode and the different strengths of current are tested. The operator should learn to judge the amount of current required to cut the different tissues. Coagulation may be carried out on the tissues surrounding the teeth of the lower jaw. This experiment can be followed by the use of the cutting knife or loop for a complete gingivectomy. The use of any muscle meat for coagulation experiments is also suggested. An incision along the lines of coagulation will show the depth of penetration of the current. Sufficient animal experimentation will give the operator the tactile sense to determine the strength of the current and depth of penetration. I am of the opinion that the operator who is unable to acquire this tactile sense or who is not fully qualified to use a scalpel should not attempt surgical diathermy in any form.

Technic of Coagulation.—For shallow coagulation using the bipolar electrode, the electrode of the Webb type is indicated. This is a delicate procedure, requiring perfect coordination of foot, eye and hand. The electrode is inserted to the bottom of the pocket, on the mesial aspect of the first tooth to be treated, the electrode is withdrawn about 1 mm., the foot switch is pressed, and as soon as blanching of the tissues is observed the switch is released. Coagulation will be extended beyond the electrode points to the bottom of the pocket. This procedure is continued until the tissues of each tooth to be treated have been encircled. The eradication of the interproximal tissue is frequently difficult with the bipolar electrode. For pockets several millimeters deep, it may be accomplished by placing the points on each side of the papillae, this process being repeated on the lingual surface until the operator is convinced that all diseased areas have been removed.

Beatty suggests a different application of his design of electrode, which is made of alloyed gold, with sharp points. He visualizes the desired shape and contour of the gum margins when healed. This is the guide to the amount of coagulation applied. He penetrates the pocket through the lingual or buccal portion as near its deepest depth as the bone will permit. From the beginning point, he coagulates toward, and including, the gingival margins. The coagulated tissue becomes blanched and serves as a guide to the number of applications necessary to eradicate the pocket.

Interproximal pockets of the vertical type are somewhat difficult to treat with the bipolar electrode. I have found the monopolar electrode more effective in this type of pocket. The patient holds the dispersive electrode in the hands, or it may be applied to the bare body. The sharp pointed electrode with slight angle is placed in the pocket at its greatest depth. In deep pockets, this may be repeated several times if doubt exists as to the sufficient amount of coagulation. The electrode may be laid on the marginal gingivae, extending through to the lingual surface; which has the effect of giving a more even contour to the healed gingivae.

If pockets are fairly shallow, no surgical pack is used for protection. In deeper pockets, which afford lodgement for food débris and secretions, the use of a pack is advised. It is not advisable to treat more than three or four teeth at one sitting, with an interval of a week or more between sittings. Areas involving several teeth, in different parts of the mouth, should not be treated at one sitting. Work should be confined to one area in order to avoid excessive reaction and discomfort in mastication. If gross

correction of traumatogenic occlusion has been previously made and coagulation has not been excessive, very little reaction will occur.

Postoperative Treatment.—The following mouthwash will be found effective after coagulation treatment and should be continued until the condition is cleared up.

Fowler's solution ..... 6 drams
Glycerine ..... 10 drams
Wine of ipecac ..... 10 drams
Hydrogen peroxide q.s.ad ..... 16 ounces
Sig.: Dilute with equal parts of water and use as mouthwash several times daily.

The average patient will return with little complaint of pain. If the patient is a neurasthenic or has a low resistance, the reaction may be sufficient to cause some pain and sleeplessness. This type of patient is given some form of mild sedative. He is advised that the coagulated area will slough off in several days and exposure of the root surface result, and that tissues and teeth will be tender for some time.

Several postoperative treatments may be necessary. The slough is removed with a swab and the mouth is sprayed with hydrogen peroxide diluted with water. Coagulated areas are painted with acriviolet, Glauber's dye or any similar germicide. In some instances, spot coagulation may be necessary later. Undercoagulation will be indicated by bright red spots, usually in the interdental spaces. These areas are handled easily and quickly by light application of the current.

The use of the toothbrush on the areas operated upon is discontinued until the areas will tolerate brushing. Gentle brushing is then inaugurated. The patient is required to use an interdental stimulator as soon as the tissues are sufficiently healed. The above procedure refers to the coagulation technic.

Previous reference was made to the fact that electrosection, owing to its refinement and delicacy, may afford the perfect modality for the treatment of periodontoclasia. My experience with this current is very limited, my observations being confined to the opinions of the pioneers in this field. Hopkins technic for gingivectomy is as follows: All examinations, tests and charts are made and the field is properly prepared. The dispersive electrode is held in the hands or applied directly to the bare skin of the patient, to insure good contact. Bleeding points are made at the depth of each pocket on the buccal and lingual surfaces. The first knife used is the flat blade, which is placed on the tissue distally to the bleeding point and drawn quickly forward through all marked points until all the lingual pockets are eliminated. The same procedure is followed in the labial and buccal areas.

With the needle point electrode, the interproximal tissues are dissected. The tissue is loose and may be lifted out with a hemostat. If any bone is to be removed, curets and chisels are used. The area is then irrigated with physiologic solution of sodium chloride to wash away any débris. A surgical cement pack is now applied to protect the tissues while healing, and for the comfort of exposed root surfaces. The use of electrosection for gingivectomy will bring to the inquiring mind immediately the possibility of devitalizing teeth and causing bone burns. A personal communication from the originator of this technic advises that he has had no devitalized teeth or bone, but has seen bone involvement following coagulation.

My own experience and the experience of others using these modalities proves rather conclusively that injury to a normal healthy pulp is not an end-result of electrosurgery. As relatively poor conductors of heat, bone and teeth require greater current density and a longer period of contact for a minimum amount of destructive effect. In working around bony structures, care must be taken to avoid damaging the periosteum. Burning

this membrane may result in necrosis of the underlying bone, with ultimate sequestration, slow healing and pain.

The probabilities of tooth devitalization and bone injury are in direct proportion to the density of current, length of application and speed of movement of the electrode. The optimum current in use for coagulation or cutting, with proper timing of application, will not cause damage to bone or teeth if used intelligently.

Chapman's technic is confined entirely to the use of a small delicate needle for the electrode. This technic makes possible the extirpation of the pocket from within the pocket itself. Further, it provides for the preservation of tissue to a well-formed base and closure of the pocket. Chapman pierces the pocket at a point midway between the buccal and lingual portions, where several stabs are made. The procedure is repeated within a month or at intervals until the pocket is eliminated. He does what he terms "slough piercing" in the molar and bicuspid regions by making a series of stabs from the buccal to the lingual aspect, to the required depth to eradicate the pocket. The pierced areas slough out in a few days, and the tissue is left with symmetrical lines. The use of the wire loop electrode with scalloping technic permits the removal of diseased tissue to any amount or depth at the discretion of the operator.

Electrosection offers a most attractive modality for periodontal surgery. The ease, deftness and rapidity with which operations on the delicate tissues of the brain and eye are accomplished with electrosection is worthy of our attention. It is obvious that this method requires a high degree of skill and experience.

Desiccation is accomplished by the Oudin current, which is of relatively higher voltage and lower amperage than the bipolar current. The high voltage in this type of current does not require the indifferent pole to allow the grounding of the current. As a milliamperemeter cannot accurately measure a monopolar current, the current densities must be learned by the operator from experience. The desiccation current dehydrates the tissues, but not so deeply as the coagulating current does, because it is more superficially confined in its action and forms a superficial coagulum. Under this coagulum, rapid epithelization takes place. The resulting wound does not bleed nor remain open to infection, because the tissue is sealed and does not form a hard cicatrix. This is true to such an extent that it is used in the cornea of the eye and for the removal of nodes in the vocal cord, where contracting scar tissue would not be tolerated.

The technic of using the desiccation current as advised by Baklor[10] is as follows: Topical anesthesia is obtained by swabbing the tissues with an anesthetic solution and inserting a wisp of cotton into the gingival crevice for a few minutes. Sufficient anesthesia is obtained without infiltration or blocking. With a dental broach in the handpiece, desiccation of the tissues is accomplished by interrupting the current with the foot switch for varying periods of from one tenth second to two seconds intermittently. After initial desiccation, the patient is dismissed for approximately a week. If any pockets indicate insufficient desiccation, the treatment is repeated. Unless desiccation has been overdone, little soreness occurs. The desiccated area leaves a dry surface with no bleeding and a soft scar under which rapid epithelization occurs. Baklor reports having used this monopolar current for treating periodontoclasia for a period of eight years with very successful results.

CONCLUSIONS

After several years' experience with electrocoagulation, I believe that there is a definite need and place for this modal-

ity. As compared with radical scalpel surgery, it is a conservative method. The time required to complete an involved case may be longer, but the benefits more than compensate. I have found it an invaluable aid in the apparently hopeless cases. These are carefully selected cases with good histories. The very satisfactory results obtained in these cases are probably due to the autogenous vaccination produced as stated by Fenton.[7]

This method has produced better results in several diabetic patients than have been obtained by any other method. This may be only a coincidence, but it is worthy of note and mention.

Electrosurgical treatment is not a panacea for all periodontal disease and there are many pitfalls incident to its use.

This modality can be used to optimum advantage in periodontal treatment when it is used to follow up subgingival curettage.

The next few years will unquestionably bring about definite standardization of methods and apparatus, and will determine the scope of electrosurgery.

Electrosurgical treatments moderate the severity of radical surgical procedure and augment the value of the conservative treatment.

The Oudin desiccation current, through its superficial or relatively surface effects, is very effective, being a highly refined hemostatic electrical curet.

Periodontists agree that subgingival curettage is the ideal and refined treatment for class one and two involvements. Treatment for deeper involved cases is better accomplished by electrosurgery or scalpel surgery. To develop skill, experience in each of these technics, judgment and discrimination in selecting the method of treatment for the case at hand is the obligation of the operator to the patient.

If the electrosurgical method of treatment will afford a more conservative treatment than scalpel surgery, which is practiced too promiscuously by the general practitioner, it will serve a good purpose. Electrotherapy has gained a place of prominence in the field of medicine and should attain increasing value in the dental fields.

Lewis Fox[11] says, "The Academy of Periodontology has a duty to perform, and that is to present to the dental profession the facts concerning electrogery and to prevent its exploitation." Since electrosurgery can be an important adjunct to the armamentarium of both the periodontist and the dentist, it must not be allowed to fall into disfavor because of the abuse which will follow its unintelligent presentation to the dental profession.

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PUBLIC HEALTH ASPECTS OF THE DENTAL CARIES PROBLEM

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As an introduction to a discussion of the public health aspects of the dental caries problem, I think it essential to reaffirm the primary objectives of the dental profession. Briefly, they are: first, the promotion of preventive dentistry, and, second, the control of dental defects through adequate and competent service.

Only recently has biologic research on dental problems shown progress. There are at present encouraging indications of a unity of effort and a more scientific approach. Progress, however, is being greatly retarded by lack of endowments and trained workers. For the present, at least, it is necessary for the majority of the profession to lend their best efforts to the problem of the control of dental defects in their incipiency. This objective is clear-cut and well-defined, consisting of the prevention of tooth loss by the replacement of carious tooth structure with stable filling materials early in life and periodically thereafter. How well this objective is being attained is revealed in recent studies, a few of which will be discussed in this paper.

Recently, a prominent health educator[1] remarked that a large part of health instruction should be devoted (1) to helping children understand that, from conception until death, the individual must depend on modern medical, dental, nursing and sanitary services for protection against disease and (2) to developing favorable attitudes with respect to medical and dental care and toward social and governmental support of public health work.

From the standpoint of dental health education, the principal job of the health educator is to motivate the individual to go to the dentist for service. The commercial broadcasters, schools, social agencies and professional groups are providing a large measure of this dental health education. However, such systematic dental health instruction as is provided is given largely in the public schools.

The distinct advantages of a health education program for school children has long been appreciated. This group represents 20 per cent of the population at a period of life when defects can be effectively controlled; they are readily accessible, since their attendance at school is compulsory; the machinery for their education is set up and directed by experts, and they are at the impressionable, susceptible mental age and readily motivated to acquire correct health habits.

A great deal has been heard in recent years concerning health as the first of the seven main objectives of education. There is ample evidence, however, that school programs generally have not been planned or executed in a manner to realize this health objective.

It is a difficult task to interest the young human animal in something un-

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related to the basic human desires, something that is or should be his by right of inheritance. School programs have been slow in giving the teaching of health its rightful place along with the three "R's" and related subject matter.

Although effective school health programs are constantly increasing, they are to date sporadic from a nation-wide standpoint. It has long been recognized by educational and public health authorities that the school health program is equally dependent on health instruction and health protection. Some good dental health instruction programs have "bogged down" for lack of a supporting dental health protective service. Dentists, nurses and others in public health work report that the dental caries control program in many places is being retarded by the unwillingness of some of the dentists to provide competent dental treatment for children who are motivated to seek it. There are, no doubt, instances where dentists willing and able to practice children's dentistry are unoccupied for want of an effective educational program or for economic reasons.

Some recent studies[2] made by the Public Health Service on 5,000 elementary school children from 6 to 15 years of age in a representative American community are very illuminating as respects the amount of treatment required and received by these children and the amount of time the dentists devote to this work. The following is a pertinent quotation from a report of those studies:

> From the findings, it is immediately apparent that the filling of permanent tooth surfaces for this group of children is being accomplished at a rate which is about *one-sixth* of the rate at which the defects are accruing. Identification of this disparity between the rate of development of defects and the rate of placement of fillings largely explains, quantitatively, the existence of the present accumulated dental needs of the children and leads to the conclusion that if such an accumulation of untreated defects in the permanent teeth is to be avoided in the future, some provision should be made to give elementary school children (in the form of fillings alone) approximately *six times* the service they now receive.

This study points out that 30 per cent of the time of the thirty-two practicing dentists of this community during one full year would be required to furnish the present elementary school population with complete dental treatment in the form of fillings for the permanent teeth, provided the amount of dental caries found in this group, plus the expected annual increment of new caries, is used as a basis. On the other hand, it is shown that only 10 per cent of the dental facilities of this community would be required to care for all the caries in the permanent teeth of this group if complete dental care were given systematically to each child upon entrance into the school system and annually thereafter.

These calculations are all based upon arbitrary estimates of professional time requirement. One hour of the dentist's time was allotted for filling each tooth surface. It was believed that this was ample time, if not excessive. If a child is cared for annually, many of the one-tooth surface cavities will be only small pits or fissures requiring much less time for repair than the estimated one hour per tooth surface.

It is of interest to know that, upon the basis of these estimates, the dentists of this community have been devoting only 2 per cent of their professional time to the elementary school children.

My point in calling attention to this analysis of the dental status of the school children in a typical American community is to show that while only 10 per cent of the dentists' working time would be required to care for the annual increase of dental caries in the permanent teeth of these children, the dentists at present are actually devoting only 2 per cent of their time to a group of the people at a period in life when dental caries can effectively be nipped in the bud and the

teeth saved for many years of usefulness.

This study did not and could not determine the condition and estimate the need of the deciduous teeth in this manner. To do this with any degree of accuracy would require a study beginning at the time that these teeth erupt and continuing until they are exfoliated. In any event, this investigation shows that to care for dental defects in their incipiency is within the realm of possibility for the 65,000 dentists of this nation, provided the children are seen early and periodically and the dentist provides competent service.

From what has been said, it is apparent that a combination of inadequate and unequal education and service, coupled with inability to pay for treatment, is responsible for the fact that we are getting the individual to the dentist years later than we should for effective control of dental caries. We cannot expect the dentist to go out and beat the bushes to round up the children. We can, however, expect him to render competent dental service for children when they are referred to him, and to take an active part in advancing the health program in his community. No one will deny the advantages for both the child and the dentist if, through educational and follow-up methods, we get the child to the dentist at the age of 3 or 4, and semi-annually thereafter. Operative procedures and child management would be simplified tremendously. Contrast the attitude and dental care of a child at a period when he is unconscious of his teeth, since they have never caused him discomfort, with those of the child whose first trip to the dentist is for the relief of pain due to extensive caries. Furthermore, as good a fee can be obtained in the first instance as in the second, and with greater satisfaction to all persons concerned.

Some interesting facts as to the amount and type of dental treatment obtained by a representative group of people in a large city are revealed in the recent study made by the Public Health Service in Detroit, Mich., as a part of the national health survey.[3]

This house to house inventory of more than 66,000 persons of all ages and economic status showed that only 22 per cent visited a dentist for any reparative dental service during the study year. Of this total, 22 per cent, the percentage of persons in the age group from 15 to 24 years who visited a dentist, was three times as great as the percentage of those in the caries-susceptible age group, from 3 to 11 years. This shows that the great majority of people are not even visiting a dentist at an age when an effective control service can be rendered.

The studies referred to and others clearly illustrate the magnitude of the problem and show how ineffectively it is being met. As previously shown, we are confronted with dental caries in more than ninety of 100 children under 16 years of age, who are developing new cavities at a rate of six for every one being filled.

These findings point to the need for a concerted effort on the part of all responsible groups for more effective health instruction and professional service.

At the present time, the training of teacher and nurse is sadly deficient in dental hygiene, and it is essential that the dentist in private practice and public health partly compensate for this deficiency. The dentist in private practice can make an important contribution as counselor and adviser to nurse, teacher and parent and by individual patient instruction in his operating room. The dental health program on the service side needs also dentists with better undergraduate training in the fundamentals of health administration and hygiene and in pedodontia.

It must be remembered that only in recent years have dental schools given lecture and clinical courses in pedodontia, and only recently has the Society for the Promotion of Dentistry for Children succeeded in getting a number of the state

boards of examiners to include questions on pedodontia in their examinations.

Few of the practicing dentists over 40 years of age have had special training in the operative technics of pedodontia, in child psychology or in the management of children in dental practice. Only a few have a natural aptitude in handling children or have taken postgraduate courses to improve their technics. Consequently, it is not difficult to understand why some dentists find the practice of children's dentistry difficult, unpleasant and time-consuming.

Mindful of the need for a greater and more effective portion of the dentist's time for the care of children's teeth, the Public Health Service, the Children's Bureau and the state health departments have sought ways and means to bring instruction on better methods and technics in children's dentistry to the average practicing dentist, with the least amount of interference with his practice. It was decided that a course of one or two days' duration, given at a number of conveniently located centers in the state, would be a practical solution. For want of a better name, it has been called "Refresher Course for Dentists in Children's Dentistry." Postgraduate courses in children's dentistry are not new. A few of these courses, on a smaller scale, have been given in the past in conjunction with a state or district dental meeting. However, this is the first time that this type of service has been sponsored and paid for by state health departments and conducted on a state-wide basis.

To better acquaint you with this plan, I shall read an abstract of a compilation of suggestions on the organization of these courses prepared by the Public Health Service and distributed to health departments:

1. Refresher courses can be conducted and paid for by the state health department but should have the cooperation and support of the state and local dental societies. In conformity with regulations, funds to defray expenses can be budgeted against available Federal Social Security Funds.

2. Centers for conducting these courses should be carefully selected and should depend upon accessibility for automobile travel, hotel and meeting places, and should be within 50 miles of a majority of the dentists in the area.

3. The itinerary of the meetings should be arranged that exact dates for each session can be made well in advance and all dentists in each area be notified in ample time to arrange to attend.

4. Each dentist in each area should be sent an outline of the course. He should also be informed as to how attendance at this course will increase his efficiency in the management of children in dental practice, give him information on time and pain-saving operative technic, increase his child practice and increase his income.

5. A typical program for one of these courses reads as follows:

(a) Introduction of speakers.

(b) Introductory explanation of the course.

(c) The relationship of public health to children's dentistry.

(d) Child psychology and the management of children in dental practice.

(e) Operative technics in pedodontia.

(f) Dental health educational methods for use in private practice.

(g) Practice building through children's dentistry.

(h) Clinical demonstration of operative technic.

(i) Round table discussion and questions and answers.

More or less subject matter can be included in the course depending on whether a one, two or more days' course is to be given at each center. All subject matter, however, should relate to the field of children's dentistry and dental health.

The personnel giving the course consists usually of a pedodontist, the director of the division of dental health of the state health department and other special lecturers, depending on the content and length of the course.

It goes without saying that the success of a series of short courses of this type

is dependent on careful planning, timing and attention to detail. No other organization can do this so well as the dental staff of the state health department. They are experienced in promoting programs; they know the state, and they have the time necessary to devote to the work. To assist those states that do not have a pedodontist on the staff, the Public Health Service has compiled a list of men in all sections of the country who are competent and have signified a willingness to devote some time to this work. The state health department selects its own personnel and pays traveling expenses and compensation per diem.

Since Social Security funds have been available, these courses have been conducted in the states of Oregon, Georgia, Ohio, Indiana, Utah, Missouri, Michigan and Minnesota. Similar courses in other states are being planned for this fall, including one in Georgia for Negro dentists.

In every instance, the state health departments and the dental societies have been enthusiastic about this type of training. All courses were well attended and the interest shown by the participants was encouraging. It is logical to assume that there will, in a reasonable length of time, be an appreciable increase in quantity and quality of dental care for children in the states conducting these courses.

Of particular significance to the dental profession is a statement in the report of the Subcommittee on Medical Care of the President's Interdepartmental Committee to Coordinate Health and Welfare, released in March of this year. The statement reads as follows: "Because of the enormous accumulated neglect in dental care among adults, such funds as are available for dental care should be directed toward preventive and other dentistry for children." This practical solution of the dental care problem is not new, but only confirms the expressed opinions of those in the dental profession who have given the matter careful thought. When the child, parent and dentist have been educated to realize that the immediate correction of small defects will bring the cost of dental service within easy reach of a majority of the people and that the needs of the minority who cannot afford even the minimum service can be more easily met by the community, the solution of the problem will be simplified.

This objective is not visionary or beyond the possibilities of attainment. The 65,000 dentists of this country may not be able to correct all the present accumulated dental defects of children, but they are of sufficient numbers to care for the annual increment of these defects if they start now with the 3-year-old child. From the viewpoint of the dentist, the failure to meet this problem lies not in lack of knowledge and technic, but in the unwise distribution of services.

I have tried to make it clear that one of our chief resources in the pursuit of public dental health service is an enlightened dental profession, conscious of its obligation to a large group of the dentally defective population.

PROBLEM OF DENTAL TREATMENT

May I again stress the need to advance professional qualifications for children's dentistry to a high standard and to provide dental health protection in terms of service that will meet the demands created by educational facilities. At the same time, I would emphasize the obligation of the dentist to support and stimulate the health educational program. The two fields are so interwoven that one cannot progress without the other. Both are integral parts of a problem that the dental profession must share if its objective is to be reached. And, last, it is essential that the dental profession in each community provide the stimulus and leadership to put into effect workable plans for adequate dental care for those

children who cannot afford to pay for it; those who on account of poverty would otherwise be condemned to go through life as dental cripples.

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A WAXING, INVESTING AND CASTING TECHNIC

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CAVITY preparation has been so thoroughly covered by lectures, magazine articles and clinics that it will not be included in this paper, but the importance of wax manipulation, investing and casting has as a general rule been only lightly referred to and therefore, it is my purpose to dwell on these fundamentals.

Today, as a result of modern technics and materials, the operator who cannot cast a good gold inlay is the exception rather than the rule.

In order to carry through any technic procedure with a minimum of effort and with the assurance that the result will be satisfactory each time, it is necessary that, besides the desire to do the work and a knowledge of the technic, the operator have at least the following requisites:

1. A definite, automatic, scientific technic to follow.
2. Standardized materials.
3. Dependable tools and equipment.

Wax, like metal, is elastic and has a tendency to spring or crawl and so must be confined by a matrix. All inlay wax, when subjected to change of temperature, becomes distorted, varying in this respect in proportion to the heat applied, and it is not controllable except to a certain extent. Wax which has been poured and allowed to cool without any pressure shows the least amount of distortion. Manipulated waxes are distorted more than are waxes poured without pressure. The wax should be kept clean and in a covered container when not in use.

For obtaining the wax pattern in direct work, a matrix should be used. The matrix should be wide enough to extend from the occlusal to the gingival portions of the tooth and to cover all proximal portions of the cavity. The occlusal edges should be festooned and trimmed to allow for clearance of the bite.

In softening wax over an open flame, care must be exercised to avoid melting, causing a loss of paraffin, which makes the wax granular and more brittle, also allowing it to flake in carving. The wax should be held just above a low flame and passed back and forth at slight intervals until it is softened throughout without melting the outside surface.

The cavity in the prepared tooth should have been blocked off with cotton rolls and dried with a pellet of cotton, but not desiccated. It is impossible to get a

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correct wax impression of a cavity filled with saliva, especially if the saliva is stringy. The wax should be thick at points of high stress, since the strength of the finished casting at these points depends on the cross sectional area as well as on the inherent strength of the gold used.

After the wax has been softened to working consistency, it is forced into the cavity under steady pressure so that it will reach the farthest extremities, in order to obtain a good basic impression. This pressure should be maintained until all tendency of the wax to crawl has ceased.

The pattern is removed from the tooth in its matrix and examined for any distortion that might be caused by undercuts or bells and incomplete margins in withdrawing the impression. The cavo-

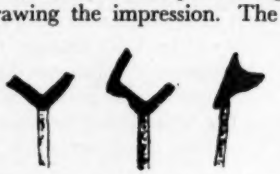

Fig. 1.—Approximate position of sprue for different type patterns.

surface and margins of the wax pattern are softened by hot air. The wax pattern is replaced in the dry preparation and pressure again exerted for at least thirty seconds. Softening the basal portion of the pattern with warm air to a depth of approximately 0.5 mm. will correct imperfections in the basic impression. With a hot explorer or similar instrument, the wax near the margins is softened or even melted; which adapts the wax tightly to the margins. Wax has a slight tendency to spring away from the margins of the prepared cavity. The final carving and burnishing are now completed.

THE INDIRECT METHOD

A copper band is selected considerably larger than the tooth. The edges of the band are trimmed to the general cervical outline, if the tooth is not in contact with the adjoining ones. With one of the approximal surfaces in contact, the band is trimmed to permit it to go partly over the occlusal surface of the adjoining tooth. We have found a colloidal material a very satisfactory impression medium. The copper band is heated and slightly embedded in a piece of high heat compound. A piece of the elastic material is softened in the flame until it is quite moldable and the glazed end plunged into the band so that this glazed end will soften the compound surface and become firmly attached to it. It is essential that this take place to prevent the elastic material, which is nonadhesive, from coming out of the band when the

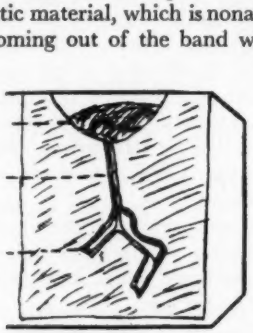

Fig. 2.—Sprue too narrow and at too great distance from sprue former.

impression is removed from the tooth. The modeling compound should extend far enough beyond the margin of the band to provide a handle for grasping in releasing the impression from the tooth. The band with the elastic material is now held over the flame for resoftening, and shaped into a cone ready for insertion in the prepared cavity. It should be held firmly on the tooth not to exceed two minutes. If it is left longer, the elastic properties of the material may be destroyed. The impression is grasped by the compound base and pulled directly off the tooth. Examination should disclose an exactingly detailed impression of both the cavity and

all the contours of the tooth. As the impression is withdrawn from the tooth, the elasticity of the material permits it to be passed over these surfaces, and, once released, it returns to its original form. This impression should not be chilled upon removal, but should be permitted to stand for ten minutes or more until its elasticity is spent.

The impression is surrounded with a strip of wax preparatory to making the model die. The die may be of amalgam or a material such as "diolite," which has a slight expansion, gives sharp outlines and sets in from fifteen to twenty minutes. It has a crushing strength of about 8,000 pounds.

For obtaining the wax pattern, the preparation is confined in a matrix and wax poured into the cavity with pressure on the occlusal surface. As before

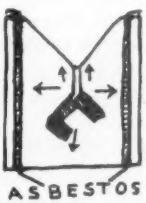

Fig. 3.—Position of wax pattern in asbestos lined ring.

stated, poured wax allowed to cool with pressure on the occlusal surface has the least amount of distortion.

The removal of the wax pattern from the cavity must be done in such a manner as to avoid distortion. With the exception of anterior three-quarter or pinledge patterns, in which a sprue is directly attached to the pattern with a small amount of sticky wax, a hooked explorer is used, and, in complex types, two explorers, to lift the pattern from the cavity, to avoid distortion. This is accomplished by inserting the explorer in the occlusal surface or at a point which will be in the center of balance of the pattern.

If a sprue is heated and inserted in the wax pattern for a mesioclusodistal inlay, for example, at the marginal ridge, when the lifting force is employed, there is danger of lifting the proximal portion of the pattern faster than the occlusal portion, and warpage results. By inserting the explorer point in the wax at a point where, when lifting force is applied, the pull is simultaneously upward in both occlusal and proximal portions of the wax, distortion is minimized.

Spruing.—To place the sprue, a bur the same size as the sprue is used and a hole bored in the pattern where the sprue is to be placed. The end of the sprue is heated and sunk into sticky wax about 1 mm. so as to form a collar of wax on the sprue. The waxed end of

Fig. 4.—Casting ring placed on a slab, or the end of the ring, covered with a rubber cup to assure complete crystallization or setting of the investment.

cool sprue is inserted in the prepared hole in the pattern and the sticky wax touched with the heated end of an explorer, which will unite it with the wax pattern. Or a drop of wax is added to the pattern at the location of the sprue and the cool sprue attached with its collar of sticky wax.

The size of the sprue is important because it has much to do with the density of the casting, and the presence or absence of minute pits in the metal. A relatively large sprue should be used. Sprues of from 12 to 15 gage, according to the size of the pattern, are indicated.

As the molten gold strikes the walls of the pattern chamber, which are cooler than it is, it congeals first at all places where it is in contact with the walls, forming a sort of skin on the casting. This skin, or film, of metal must also form along the walls of the sprue-way, but if these walls are sufficiently far apart, a space will still be left along the center of the sprue-way through which more gold can be forced to the casting, as long as the gold remains molten and the pressure is continuous. When molten gold congeals and begins its first and second stages of contraction, it does so first at the outer layers of the casting. If it can be supplied internally with fresh molten or semimolten gold under pressure during these first two stages of contraction, the casting should be denser,

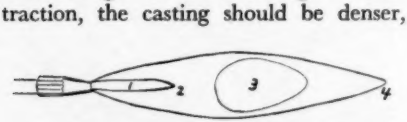

Fig. 5.—Properly adjusted blowpipe flame. The part of the flame just beyond the tip of the cone (marked 3) is the reducing part. If this part of the flame is used, oxidation of the gold is considerably reduced during the melting operating.

with less contraction of the finished casting, and without visible intercrystalline spaces when the outer film is polished away. It should be a sounder and stronger casting.

If it is too narrow, a sprue is used; the film on the walls of the sprue-way close up the orifice as soon as the film is formed, and even though the nugget may still be molten and the pressure is still applied, the molten gold cannot enter the interior of the casting itself to assist in feeding the contracting film. The result is a more porous, pitted casting, which has less strength.

The position of the sprue is important because gold congeals very rapidly in casting and the sprue should direct the gold as rapidly as possible toward the most distant margins. Each pattern is sprued in such a manner that all parts of the wax pattern are beyond the point at which the sprue enters and in a direction which allows the gold to flow toward distant margins. In attaching the sprue to the pattern, a small piece of sticky wax is either added to the pattern or placed on the sprue, heated slightly and not embedded deeply in the pattern. Driving a hot sprue deeply into the pattern may cause distortion and failure by releasing stresses in the wax. It is also advisable to use clean sprues so as to leave a clean polished surface in the investment on withdrawal. The pattern is mounted on the crucible former in such a position as to leave about an equal amount of investment around the pattern. This no doubt promotes more equal expansion in all directions, and also does not expose any one angle of the pattern chamber to excessive heat because of too close proximity to the metal ring. The sprue from crucible former to wax pattern should be on the average as short as possible.

INVESTMENT COMPOUNDS

There are several so-called compensating investment compounds which are an aid in producing correctly fitting castings, such as "cristobalite" investment and control powder, which provides for the variation in degree of expansion necessary for the different types of inlays. Its use assures a casting that has a loose or a glovelike fit. Special attention is given to the setting and thermal expansion of the investment, which must be sufficient to compensate for the shrinkage of the casting gold, approximately 1.25 per cent.

The type of refractory material and proportion to plaster determine the character of the surface cast against, the strength of the pattern chamber walls at the time of casting and the amount of setting and thermal expansion as they affect the compensation for the shrinkage of wax and the contraction of the

alloy from its molten stage. A slightly higher value than 1.25 should be allowed for the higher fusing, high platinum content golds, since these contract more on freezing.

After the casting ring is lined with a layer of moist asbestos, it is placed on a glass slab, or the end of the ring is covered with a rubber cup, to assure complete crystallization or setting of the investment.

A proportional scale is used to weigh the water and the investment. The water used should be kept in a bottle at room temperature. Water taken directly from the tap has confined air; also, the variation in temperature of the water will cause wax distortion. In mixing, the powder and water are incorporated by means of a hand spatula, for ten seconds. Next the mix is vibrated by either a mechanical vibrator or by vigorous tapping on the bench to remove the very large air bubbles, after which mixing is done mechanically for at least thirty seconds. A mechanical mixer will produce a 20 per cent stronger mix than can be obtained by hand spatulation and also assure uniform consistency of mix.

To clean the wax pattern, all the surfaces are painted with the investment mix, washed with room-temperature water and dried thoroughly with air. This will allow the next coating investment to adhere to the wax pattern and minimize the danger of air bubbles. The investment is now lightly vibrated with a serrated instrument. The asbestos-lined ring is filled with the investment material, and the inverted sprue base with its painted pattern is gently vibrated down to place over the ring. This causes the investment in the ring to settle closely around the pattern as it moves downward. The filled ring with the pattern within must never be jarred or vibrated under any conditions, as the jarring or vibrating causes air bubbles in the mix to rise to the under surface of the pattern, brings the water to the surface in the ring and causes the settling of the denser parts of the investment to the bottom of the ring. This results in a thinner mix near the surface and a thicker one near the bottom, and in uneven expansion. At least thirty minutes should be allowed for the settling of the investment. A longer time will do no harm.

WAX ELIMINATION

Wax elimination is very important and the necessity for a proper procedure is often overlooked or its importance minimized.

There are two types: rapid and slow. The rapid depends on sudden application of heat to develop steam and thereby actually wash the wax out through the sprue hole before the water is dried out of the pores of the investment. The presence of water in the pores of the investment prevents absorption of more than a small amount of wax from the investment. Practically all of the wax goes out through the sprue hole. This is a clean, quick, sure method of wax elimination. In the slow type, heat is applied so slowly that the water dries out of the investment, while the wax remains in the mold. After the water dries out, the molten wax is absorbed into the pores of the investment. The temperature then is increased and the wax burns, with a carbon residue. Eventually, with prolonged heating, the carbon is burned out.

The rapid method seems to be preferred by the majority of operators, for with practically all the wax removed through the sprue hole, the small residue which is absorbed is not difficult to burn out. With the slow method, a carbon residue is left which it is difficult to remove. If any carbon residue is present in the mold when the casting is made, failure may result, for the presence of carbon prevents the free passage of air through the investment, with the result that air may be trapped ahead of the

incoming gold. In addition, the presence of carbon in the mold at the time of casting sometimes results in pits or blow holes in the casting and a roughened cast. With this rapid method, the electric furnace is turned on at medium heat as investment of the pattern is started and, after thirty minutes or longer, it is placed in the furnace, sprue hole down. At the end of from forty-five to sixty minutes, the furnace will be at 1300° F. and the case can be left at this temperature until we are ready to cast, since longer heating will do no harm as long as the temperature is maintained at 1300° F.

A temperature of 1300° F. seems to be the ideal expansion point for high heat investments. Overheating the mold is to be avoided since there is danger of decomposing the gypsum, present in all investments. If this occurs, it will form the highly corrosive gases, sulfur dioxide and sulfur trioxide, which attack and embrittle the gold, and also the flask and heating elements of the furnace.

Accurate waxing will be nullified if proper expansion is not obtained from the investment. Therefore, the casting temperature must be carefully watched. Some operators like to judge by the eye, using the red sprue hole as a guide, but what is dull red to some eyes is bright red to others. More overheating of investments results from searching for the red sprue hole than for any other reason. At 1300° F., a sprue hole is a dull red and in daylight is often hardly visible. A bright red sprue hole is usually 1600 to 1700° F. and in the bad shrinkage range.

The use of controlled electric heat eliminates watching and the case may be cast at any desired time after elimination of the wax is complete. Controlled electric heat does not overheat, and has no undesirable combustion products. Gas heat is not so satisfactory for the wax elimination. Often the combustion products of the gas flame will enter the investment and deposit carbon, interfering with the production of a satisfactory casting. In addition, the gas heat is difficult to control and overheating often results.

MELTING AND CASTING THE GOLD

This is one of the most important steps in the making of a casting, since here the metal can be ruined regardless of the precautions taken prior to this step. The physical properties of the gold to be used should be carefully considered and the one best suited for the particular purpose at hand selected. Such properties as Brinell hardness, tensile strength, ductility and melting range should be known, as each of these bears a definite relationship to the final usefulness of the restoration.

Generally speaking, all casting alloys contain a varying percentage of base metals. When these complex gold-platinum alloys are molten, they are readily subject to contamination or possible ruination as regards the purpose for which they are intended, through mishandling on the part of the operator. Absolute cleanliness should be observed throughout the melting and casting technic. If casting is done on a centrifugal machine, the crucible should be relined with clean asbestos paper prior to each casting, regardless of whether a similar alloy is again being used. It is advisable to use new gold for each cast, but if a used gold or one to which new gold is added is employed, it is preferable that it be cleaned by melting on a charcoal block, with flux (calcined borax) added to combine with the impurities. The gold should be melted in a reducing gas flame, then pickled in acid.

It should be kept in mind that only very small percentages of certain metals will so change the properties of gold alloy as to destroy its usefulness. Lead is the most notable in this respect. If gold is alloyed with it to the extent of only 0.15 per cent, the gold is rendered use-

less. Other metals found in the dental laboratory and office having similar effects are: mercury, bismuth, tellurium, antimony and cadmium. Most of these metals are present in the low fusing alloys used for models.

MELTING

Various types of blow-torches and combinations of fuels are used in different parts of the country, the choice depending on local conditions. The flame temperature and quantity of heat given off will therefore vary. The combinations of gases most frequently used, arranged in order of intensity of heat, are as follows: (1) oxygen and acetylene, (2) oxygen and hydrogen, (3) oxygen and gas, (4) hydrogen and air, (5) hydrogen, (6) acetylene, (7) gas and air and (8) volatile liquid fuels.

Extreme care must be taken with the oxygen-fuel combinations and they are not recommended for the usual golds.

The gold in all cases should be kept in the reducing portion of the flame and the metal cast when thoroughly fluid and when the button is clear and bright.

CASTING

The actual moment at which to cast is best determined by noting the fluidity of the metal by shaking the mold or the casting machine slightly. In general, the higher fusing the casting gold, the more it should be superheated.

There is of course some optimum temperature at which a gold of a given composition and melting range should be cast in order to have the best results. This, however, cannot be controlled except in special cases where the nature of the casting is the same at all times and the mass of material is constant. Such conditions do not exist in the case of dental restorations, in which shape and weight vary greatly. It is far from correct to assume that the temperature ideal for a small inlay would also be ideal for a large complex partial denture. Refinements in technic claiming to control all these variables under all conditions are entirely impractical and incorrect.

Gold, to be in its softest condition, should be reheated to a dull red (1300° F.) and quenched in water or acid. Hardness takes place owing to slow transition from dull red heat to room temperature.

The pickling solution may be either a 50 per cent solution of sulfuric acid in water or a 50 per cent hydrochloric acid solution with a quarter inch layer of mineral oil on top to suppress fumes. Hydrochloric acid is very injurious to some alloys, especially those which contain a small percentage of zinc, and also to solders.

It is important to change the acid frequently, as acid that has been used too often contains impurities and base metals such as copper, which leaves a coating on the casting.

333 Linwood Avenue.

THE PRACTICAL AND ECONOMIC VALUE OF PERIODONTAL PRACTICE

By Olin Kirkland, D.D.S., Montgomery, Ala.

SINCE the year 1840, when modern dentistry began to grow and expand from a small nucleus which found fertile soil in the City of Baltimore, it has continued to advance onward and upward without interruption; and today there is a greater demand for dental service than ever before in the history of the world.

The public is coming to understand what good dental care means to them and their interest in it is increasing. Dentists are doing much to teach people the value of care of the teeth and schools are educating children and their parents to its importance. All this means that the demands for dental service will continue to increase.

The importance of dentistry is coming to be realized more and more, because the health of the rest of the body is greatly affected by the condition of the mouth and teeth and dentistry is no longer regarded as a handicraft or a trade but has become one of the leading professions.

Those who have contributed to its success, whether they happen to be leaders or conscientious workers among the rank and file of the profession, have every reason to feel proud of the achievements of dentistry during the past ninety-eight years, and there is just cause for a feeling of security in the future development of dental science.

Notwithstanding the fact that dentistry may proudly boast of its establishment as a profession upon a solid foundation, we cannot say that all phases of dentistry have reached a state of perfection. In spite of the remarkable progress made, there still exist problems the solution of which would elevate dental service to a much higher plane.

The time has come when those who are engaged in the practice of dentistry and who feel an interest in its future development must realize that a full measure of success may no longer depend, solely, on extracting teeth and restoring lost parts. Technical procedures have, in a measure, been mastered, as mechanical dentistry has closely approached a state of perfection. Consequently, the profession has every reason to feel proud of its accomplishments in this particular phase of dental practice; but there is still one weak link in the chain of dental progress. This phase of dentistry has been neglected, but with the manifestation of that degree of interest which its importance justifies, this one weak link could be made as strong and durable as any other link in the chain of dental service.

We refer specifically to treatment of the group of diseases involving the gingivae. It may be stated without fear of contradiction that the management of diseases affecting the supporting structures of the teeth has not kept pace with the general dental advancement. In this phase of dental practice, we have some momentous problems yet to be solved. Consequently, the next forward step in the advancement of dentistry will inevitably depend on a more satisfactory

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approach to prevention and control of periodontal disease. A pendulum swings as far as it can in one direction, then swings back, but it never stands still. So it is with all great world movements; and so it will be with dental progress. We either go forward or we go back. The future of dentistry can be made secure only by those who teach and practice the profession.

Only a few years ago, it was generally believed that man would never fly in a machine heavier than air, and a few decades ago, a ship had never made a successful voyage under the sea; but man's ingenuity, aided by science and mechanical developments, has overcome obstacles, and today these seemingly impossible feats have become commonplace. Within the brief span of a lifetime, numbers of baffling diseases have yielded their secrets to the medical profession, and today such diseases as smallpox, yellow fever, diphtheria, typhoid fever, malaria, pellagra and hookworm disease have all been conquered, and they no longer claim their victims by the millions.

There are today a number of diseases, commonly encountered, which are still baffling the greatest minds in the medical profession, but the physician does not give up in despair, ignoring them because they present perplexing difficulties. Not at all. Instead, he seeks all the more diligently for ways and means to prevent and cure them.

The control of pyorrhea is the greatest problem confronting the dental profession today, and if we are to manage this disease successfully, we would do well to follow the example of the physician, seeking ways and means to control the disease instead of ignoring it as we have done in the past. Periodontal disease is the one and only problem in dentistry which has not been handled with, at least, a reasonable degree of success. In view of the fact that this pathologic process is responsible for the loss of at least 50 per cent of the teeth, which, for the sake of health and comfort, are being sacrificed, it is indeed the number one problem that confronts dentistry today. The question those most interested in dental welfare would ask is: What are we going to do about it? Will dentistry go on forever facing an unsolved problem which constitutes a menace to the health of the human race and a challenge to dental skill and ingenuity without making an honest effort to bring about its solution? Let me say that it will not. When it is realized that pyorrhea is responsible for a great many painful and disabling diseases, not to mention the countless millions of teeth which could be saved, we are, I believe, safe in making the prediction that something definite will be done about it.

Periodontal disease is now being treated successfully by many members of the profession, but to the rank and file it is still shrouded in deep mystery. I recently had an example of the lack of interest in and knowledge concerning the management of periodontoclasia in various parts of the country.

About two years ago, a young woman, aged 28, residing in the middle west came to my office for advice and treatment. Examination disclosed a complex or advanced phase of periodontoclasia. The patient was 5 feet 6 inches tall and weighed 110 pounds. She suffered from a digestive disturbance, with slight fever, anemia and general malaise. Her mother stated that she was treated for several years by a dentist in the village where she resides, but the results were not satisfactory and she decided to consult a dentist in a larger town. After four years of treatment with various medicinal agents, the more advanced lesions began to show acute inflammatory symptoms, and the dentist thought it best to make x-ray pictures of the mouth. These disclosed evidence of periodontal pockets throughout the mouth. The patient was told that she had a touch of pyorrhea and it would be necessary to remove several teeth, but she refused to have them extracted. Her mother thought it best to find another dentist, so they went to St. Louis for treatment. The patient failed to

get relief and so decided to try some one who had been recommended in Kansas City. The results were equally unsatisfactory.

As she was steadily declining in health, her parents decided to take her to the West Coast, where treatments were continued in Los Angeles and San Francisco, without success. They visited the Mayo Clinic and later Johns Hopkins Hospital, where physical examinations indicated the need of eradication of oral infection either by extraction or otherwise, but the patient steadfastly refused to give up her teeth. From Baltimore, the family decided to go to Florida, and from Miami and Tampa, they came to my office for treatment. We performed gum resection in the posterior sections of the mouth and semiflap operations in the anterior regions, which successfully eradicated the foci of infection.

The patient's recovery progressed as the infection was eliminated, and shortly after the last operation, all of the general symptoms disappeared. I saw this patient at the American Dental Association meeting in St. Louis and she told me she was in perfect health and had gained 9 pounds. The gingivae were apparently healthy and she has not lost a tooth.

The unfortunate victims of periodontosis are not, commonly, so persistent in their search for effective treatment as this one was and, as a rule, submit to the customary procedure, which is extraction, but, as a general rule, these cases, like the case described, are amenable to treatment.

The above-described experience is, no doubt, similar to that of others who find relief of their cases on consulting trained periodontists; but, in most instances, they fail to find a dentist who understands the disease. What we most need is more and better trained periodontists and more satisfactory cooperation on the part of the general practitioners. It should not be necessary for a patient to travel all over the country to find relief from this common malady.

Failure to recognize and treat gingival infections is not due to lack of either skill or intelligence among those who compose the dental profession. We can boast of the fact that the possession of both of these attributes is comparable with the qualifications to be found in any other profession.

It is my opinion that this phase of dental practice is avoided for two main reasons: (1) limited education in periodontology and (2) its unsatisfactory economic value in the average dental practice. If the standard of fees could be raised considerably above the compensation realized in other fields of dental practice, the profession would soon be crowded with periodontists, and they would surely find a way to treat the disease successfully.

The institutions responsible for dental education are teaching the things students want to know. There is but little demand for knowledge concerning periodontal disease because the student realizes that he must depend on other phases of practice to earn the necessities of life. Consequently, the dental schools devote as little time as possible to subjects not generally included in active dental practice. I need not tell you that periodontology is one of the neglected subjects. The result is that the majority of young dentists go out to serve the public wholly unprepared to treat these pathologic conditions.

I am sure that most of them do the best they can to cope with the periodontal problems which inevitably confront every man who chooses dentistry for his life career, but with a limited knowledge of the disease, their efforts are doomed to failure even before they begin treatment of the first case. Consequently, they become discouraged and, early in professional life, arrive at the conclusion that pyorrhea cannot be cured. As it is always more or less embarrassing to admit failure, the easiest way to explain the situation to the patient is to declare that pyorrhea is an incurable disease. After many unsatisfactory experiences, the average dentist

fails to observe the gingival crevice while making routine examinations and almost forgets what it looks like. When the disease has advanced to the point where it can no longer be ignored, the patient, usually discovering it himself, calls attention to the symptoms; namely, hemorrhage, pus and loose teeth, and then the dentist is forced to admit that there is just a touch of pyorrhea. At this stage of development, the disease could be cured in the average case, but the dentist attempts to treat it and, because of his limited knowledge and experience, the pathologic processes continue to destroy the supporting structures of the teeth. In the course of time, periodontal abscesses form, and one by one the teeth must be extracted.

This little drama has been enacted so frequently in dental offices all over the country that the public has become thoroughly skeptical as to the possibility of treating the disease successfully, and has accepted the belief of a large percentage of the dental profession that the disease can neither be prevented nor cured and that treatment would be a waste of time and money. There is a way to treat pyorrhea successfully, but the operator must in some measure understand its etiology, make an early diagnosis and apply his knowledge to a definite operative technic which will leave no doubt concerning the eradication of the infective foci.

For more than a quarter of a century, my time has been devoted exclusively to the prevention and treatment of periodontal disease. During those years, I have had an opportunity to make a great many observations concerning both the practical and the economic problems involved in its management. There is absolutely no doubt concerning the feasibility of successful treatment. Periodontal disease can be controlled with much less effort than is required to control caries, and with equal assurance of success. Furthermore, there is no substantial reason why the treatment of periodontia should not provide compensation comparable with that derived from dental service rendered in other specialties in dentistry.

I have found that patients will gladly pay larger fees for pyorrhea treatment than they are willing to pay for other dental operations. The reason for this is obvious: the average individual realizes that while paying for the eradication of dangerous foci of infection, he is also investing in health and at the same time preserving teeth which would otherwise be lost. As a consequence of many years' experience in the management of periodontal disease, I am convinced that treatment is justified in all cases except those in which surgical interference may be contraindicated because of certain systemic diseases in which surgical measures would be impracticable, or the destructive influence of the disease has robbed the teeth of so much structural support that they cannot be restored to normal function.

While there is not a shadow of a doubt that the disease can be cured, we should not expect or promise too much, in either treatment or postoperative results. There is necessarily, in accordance with the nature of the disease, more or less bone resorption around the teeth, with deep pockets, and the successfully treated areas will inevitably shrink to the full depth of the lesions, regardless of the method used; but, under proper management, the teeth will become firm in their sockets, and the pus pockets will heal satisfactorily.

In order to maintain the periodontal tissues in a state of health after the treatment of pyorrhea, the gingivae must be kept under observation by following the same routine as that commonly used to control caries. By this, we mean that the mouth cannot be treated and the patient be permanently dismissed when the wounds are healed as may be done in case of the removal of an appendix or in

tonsillectomy. On the contrary, the gingival tissues must be watched for recurrent gingival inflammation with the same meticulous care as is observed in the management of caries. When a new pocket does recur, it is just as important to give it prompt treatment as it is to fill a new cavity in a tooth, and it should be done as soon as possible after it is discovered.

With precisely the same care and attention given to gingival conditions as are usually given to caries, periodontal disease could not exist. I wish to emphasize the fact that of all the diseases to which the human body is susceptible, there is not one that can be treated with any greater assurance of success. Every dentist who has made observations has noted the immediate cessation of inflammatory symptoms when irritating deposits have been removed from beneath the gingivae. This should prove conclusively how easy it is to check gingival inflammation in its primary stage.

The control of periodontal infections cannot be managed by the specialist alone. It is a momentous problem and its solution will require the combined efforts of the dental profession. If all the trained periodontists in existence were located in the City of New York, it would be impossible for them to treat one-fourth of the people in this city who are the victims of periodontal infections, and in need of such treatment.

Merritt says that in the prevention, diagnosis and treatment of all periodontal disorders, the family dentist must be held responsible. It is to him that the public naturally turns for the solution of all its dental problems, and if he fails in this responsibility, he is failing in the performance of a duty which he owes to those who trust themselves to his care. Since it is he who has charge of the patient from childhood to old age, it is obviously his duty to be so watchful of the periodontal tissues as to prevent or make an early discovery of any disease which may be developing.

It is a well-known fact that one of the most common diseases of the oral cavity is concerned with the supporting structures of the teeth. There can be no doubt that it shares equally with dental caries in providing the world with dental cripples. It is equally well known that a minimum of professional effort has been directed toward its prevention and cure. Countless numbers of teeth affected with pyorrhea that could be treated and restored to a state of health and usefulness are lost daily.

If we are to maintain the prestige that dentistry has won for itself in the first line of defense against disease, it is quite evident that we must rely on a more intimate knowledge of the pathogenic processes which occur in the investing tissues of the teeth. Furthermore, we must find ways and means of managing them as successfully as we now handle other problems involved in dental practice. The neglected oral cavity is an ideal breeding place for all species of bacteria, and the gingival crevice in a neglected mouth provides an easy portal of entry for the invasion of the body tissues by the disease-producing organisms which thrive and propagate in these neglected areas. In order to safeguard the oral health of the people of this country, the dental profession must realize that dental service which does not include intelligent care of the gingival tissues is far below the standard of service that might be expected from a well-educated, progressive member of the profession.

Let us remember, while protecting the oral cavity against disease, that tooth extraction is not the only means by which periodontal disease can be successfully treated. Countless millions of teeth that could be saved without in any way endangering the health or comfort of patients are needlessly sacrificed because of periodontal infection.

Research, within recent years, has de-

veloped new theories concerning oral infection and its relation to morbid conditions found elsewhere in the body structures. These discoveries have brought about a new evaluation of the importance of dentistry in the first line of battle against general disease, and, as a consequence, there is an increasing demand on the part of the medical profession for closer cooperation in the eradication of pathogenic factors as an aid in the protection of general health. While dentistry has always been associated with health, its altruistic principles as a health measure were never before regarded with the same degree of importance as today.

Several years ago, the American Dental Association proposed a slogan saying that dentistry could add ten years to the span of life. That expresses an ideal which is not beyond our limitations, provided we, as dentists, see fit to recognize our responsibility to our patients and the profession to which we belong. But are we doing our part when we ignore the existence of focal infection in the gingival tissue?

Boyd S. Gardner says: "The health of an individual is dependent on a chain consisting of ten links, for three of which the dental profession must assume responsibility; namely, gingival infections, apical infections and cysts." The dental profession has not only assumed the responsibility for apical infections and cysts, but also is handling these cases in a most creditable manner. However, we must admit that gingival infections are ignored and neglected.

The dentist who would aspire to the greatest heights of success and who would give the most constructive service to the public may feel assured that the average person will willingly pay much more to save his teeth than he will for extractions and replacements. People are interested in having their teeth and the supporting tissues restored to a state of health and desire to have teeth removed only when necessary.

Let us remember, while giving dental service to mankind, that mouth health and body health are interdependent. A healthy mouth cannot be maintained in a diseased body; neither can a healthy body be maintained if the individual is handicapped with a diseased mouth; therefore, mouth health and body health are inseparable.

In the truest sense of the word, dentistry is definitely a health measure, and the mouth should be regarded as the first line of defense against disease-producing organisms which invade the body tissues. Therefore, the responsibility of protecting the public against disease of dental origin must rest squarely upon the shoulders of the dental profession.

When we have organized the forces of dentistry in the field of prevention as well as the treatment of all phases of oral infection, the public will enjoy a type of dental service that will take on a new meaning, and dentistry will indeed play an important part in making the world a better place in which to live.

722 Shepherd Building.

PREVENTION AND ELIMINATION OF THE MANY CAUSES OF SYSTEMIC DISTURBANCE BY MEANS OF THE TOOTHBRUSH AND OTHER STIMULATING INSTRUMENTS

By W. J. CHARTERS, D.D.S., Des Moines, Iowa

ALMOST all dental patients over 12 years of age are afflicted with dental decay or periodontal disease, or both. Although members of the profession know that these alarming conditions prevail, they appear very indifferent.

Does it seem rational to allow *L. acidophilus* and the affiliated bacteria of periodontal lesions to continue destruction when nine-tenths of these organisms can be dealt with successfully in the mouths of those who place their welfare in our hands?

Few members of our profession are scientifically teaching prevention. I am not referring to the dentist who tells his patient to take good care of the teeth and brush them often. This advice has been handed down for generations, with little, if any, preventive results.

Although we may think that we have accomplished something along the line of preventive dentistry, we have merely made a beginning in mechanical prevention.

I do not mean to be egotistical, but I do believe that we can help our patients to assure beneficial results by proper instruction. Consequently, I shall mention the many systemic disturbances to which we have fallen heir. Dental practice has proved that these can be eliminated.

The first and easiest conditions to overcome mechanically are the feeling of fatigue, muscular rheumatism, eczema, constipation, paralysis and numerous painless ailments. Certain conditions of the gingivae and adjoining tissues can cause these different systemic disturbances.

Secondly, painful conditions such as neuritis of the neck, arm, leg, eye and ear, sciatica and lumbago are frequently caused by the presence of irritated pulps.

I am looking forward to the day when these conditions will be prevented instead of cured by devitalization or extraction.

The seriousness of these ailments is being felt by the ranks of our patients who are taking brushing lessons. In one dental office this year, ten patients were compelled to discontinue these lessons because of neuritis of the arm, and two because of neuritis of the neck. You can readily understand the seriousness of this handicap to the patient in practicing his lesson.

The successful teaching of prevention makes it necessary to transfer nine-tenths of the time now spent in teaching diet to explaining mechanical stimulation. This technic cannot be successfully taught from the platform. Personal demonstrations are absolutely necessary.

The office plan and technic for pre-

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venting and eliminating ills are as follows: When a patient seeks advice, sufficient time should be allowed for him to relate his troubles, as a complete systemic and oral history is necessary. The dentist should keep in mind the fact that the patient whether young or old is susceptible to numerous mouth ills, and that it is a dentist's responsibility to restore the patient to as nearly normal health as possible.

The cooperation of the patient is absolutely necessary if desired results are to be secured.

Secondly, when work is started on a minor case or an apparently normal one, fine, slender metal instruments are inserted between the teeth. This is followed by applying light intermittent pressure on the interproximal soft tissue.

In most cases, bleeding will be noticeable. The patient is permitted to observe this condition, and is told of its seriousness. Thus, he can instantly see for himself what no amount of explaining and talking by the dentist can demonstrate. We have won confidence and are now ready to proceed.

The hard deposits and stain on the teeth are removed and the free gum or surface adjoining the teeth is cauterized with 95 per cent phenol. The reason for this is that by the use of scalers, we have created much more absorbing tissue than existed before the operation, and the phenol will sear this surface and prevent bacterial invasion. After thirty-six hours, Nature, aided by stimulation, will start to build up a resistant tissue.

Polishing the dentin has been purposely omitted because, in many cases, the teeth have been left very sensitive; while in others, permanent pulp irritation has been caused.

The interproximal toothbrush technic was developed for the purpose of stimulating gum tissue, especially between the teeth, and for the removal of film, mucin or débris from the teeth. The patient may be shown this débris by the use of disclosing solution. He is then told of the necessity of its removal with the aid of the toothbrush since no medicinal agents can effect this. During the time that the patient is learning to use the toothbrush correctly, all toothpastes, mouth washes, etc., should be discarded, to avoid confusing him.

There is no method of using a toothbrush that will clean all of the surfaces of all teeth, or stimulate the entire gingiva around every tooth. But there is a method that will stimulate all of the gingivae and clean most of the tooth surface, provided the inaccessible places have been prepared to receive the toothbrush and other stimulating instruments.

The mouth ablution of the primitives was very effective because etiquet was ignored. Now, any one seen using a toothpick is in disgrace. The word toothpick will have to be discarded and the terms wooden or metal stimulators be substituted.

Many people go through life dressed in all kinds of finery, yet in their mouths they harbor hundreds of different species of man-eating termites. This vast army have more hideouts and more efficient protection than our original public enemy number one.

This makes it necessary to repair tooth decay and eliminate congestion of gum tissue.

The many different modifications of the original interproximal tooth brushing technic should be considered at this time.

I presume that we all agree that to clean an object or surface, the cleaning instrument must come in contact with that surface. The original method places the bristles between the teeth at an angle ranging from 15 to 45 degrees, depending on the contour of the gums, and moves the bristles with an up-and-down motion, or, better still, with a circular motion. When one uses any angle other than the 45-degree angle, the bristles must point toward the incising or grinding surfaces. One can easily understand

how the sides of the bristles clean the teeth and stimulate the gums with the same process.

In teaching the patient to brush the teeth, it is important to stress the amount of pressure to be applied. The novice often injures himself by being over enthusiastic in applying pressure. When the patient becomes accustomed to the small amount of pressure needed, he begins to progress. The pressure in using the brush on the lingual, buccal and labial surfaces and the surfaces joining edentulous territory is from 1 to 4 ounces; the interproximal pressure is from 1 to 4 pounds.

Sometimes, areas have to be prepared to receive the toothbrush and other stimulating instruments. In advanced periodontia cases, there exists a concave surface between the teeth. These surfaces cannot be reached. The dentist, therefore, trims the hard and soft tissues buccally and lingually, to produce a flat or convex surface. The long, flat contact surfaces produced by the overlapping of teeth are usually on the cuspids and the lateral and central incisors. This abnormal condition should be corrected.

About 2 mm. of the gum and process should be removed perpendicularly to make way for the stimulating instruments. Tissue that is congested from the presence of ill-fitting shell crowns and inlays beneath the gingivae should be incised and sufficient tissue should be removed, since intermittent stimulation will increase, not decrease, gum thickness.

The first twenty or thirty seconds of stimulation seems to injure or traumatize the tissue temporarily. During the next five or ten minutes, the stimulation seems to produce an agreeable effect. If stimulation is continued for a longer period, the condition is the same as for the first twenty or thirty seconds. The first and third periods of injury can be obliterated with a series of lessons and treatments. Of course, the soft tissues vary in different mouths, and so the length of time for complete success will vary. One thing is certain: Gum tissue in every patient, including diabetics, does respond to stimulation, and the use of foods or drugs can never have the same fine results.

After all of this has been accomplished, the patient should be made to understand that results will be lasting if he cooperates in every way. The patient will be notified and be expected to report to the dentist for inspection at regular intervals. He should become aware of the necessity of dental visits for maintenance of oral health rather than for correction only. A call system should be placed in effect.

In conclusion, let me say that in order to get the proper results, it is necessary to synchronize the various dental activities. In early childhood, correct diet is important and malocclusion should be eliminated. The next important step is stimulation by correct use of the toothbrush and other instruments. Note that I say correct brushing. Where necessary, dental surgery should be used so that proper stimulation may proceed. The keynote of saving one's teeth regardless of all mouth corrections is stimulation of the gums, and this can be accomplished only through correct brushing, and through correct use of the various stimulating instruments.

415 Southern Surety Building.

ETHICS, THE SOUL OF DENTISTRY (III)

By J. Wright Beach, D.D.S., Buffalo, N. Y.

In two preceding articles, the basic thought involved the concept of an ethical foundation which will adequately support the superstructure of our profession. Let us now direct attention to the cohesion of integral elements as expressed in the body corporate, the American Dental Association. This historic exponent of our profession has ever stood as a beacon for our guidance and safety. Within the circle of its ministrations, the fulness of the life of dentistry constantly dwells.

As one whose career in the profession has bridged the period marked by the development of "modern dentistry," there have been afforded to me exceptional opportunities to trace from advent to conclusion many promising developments and widely heralded discoveries which long since have been relegated to the shades of forgotten contrivances. However, rising from ashes of failure and overweening enthusiasm, many of our most valued procedures and inventions have triumphantly emerged to serve and bless humanity. Likewise, the accepted methods and treatments in present use have had their inception and development during a comparable period of time, and all have been safeguarded by the ethical standards governing the American Dental Association. It is universally conceded that our calling has recorded exceptional advancement in methods of amelioration of human suffering and in the preservation of health. This is inspiring and it encourages us to strive for still higher standards of skilled and technical service.

It is significant to recall that the World War found our profession with but the simplest means of meeting the existing situation. Our service personnel consisted of three active Army dental surgeons, two of whom were with the National Guard at the Mexican border in Texas. The third was on special duty in Ohio. Fourteen months prior to the declaration of war, three members of the American Dental Association organized the Preparedness League of American Dentists, "to aid our Army Dental Corps by voluntary service of its members." It was "the desire of its organizers" to be able to assure the Surgeon General of the U. S. Army, not later than July 1, 1916, that twenty thousand dentists had joined the League. The achievements of the League during the World War were largely dependent on the endorsement of the American Dental Association and the cooperation of its official organ, The Journal. The surviving member of this trio of founders desires to emphasize the fact that the accomplishments of those stirring years of activity would have been infinitely less marked without the support and ethical guidance of the American Dental Association, which clearly demonstrated the constructive value of its influence. It is, indeed, a privilege to make this acknowledgment.

The entrance of the younger practitioners into the Dental Reserve Corps in 1917-1918 opened a new field of service. In concentration camps, they embarked upon a new order where oral surgery in its broader application somewhat overshadowed the routine procedure of op-

erative and prosthetic dentistry in private practice. The dentists' outlook had changed materially as war oral surgery became an immediate need, stimulating each man to greater ambition and leading the way into an enlarged field of activity.

The direct effect upon post-war practice of dentistry was to encourage research workers in pathology, diagnosis, roentgenographic interpretation, surgical procedures and general expansion of the specialty of oral surgery in all directions. Of particular note has been the promotion of understanding and the closer collaboration between medical and dental practitioners. The dental curriculum is constantly reaching a bit further into that of medicine and the interchange of terms and practices becomes more constant.

The significance of this situation points to the widening of the distance between the old and the new schools of dental practice, and stresses the fact that, while basic ethics will never change, the new order demands conceptions which may appear somewhat elastic, in view of prewar usages. Our standards must follow these variations without capitulating to unprofessional acts or to hazards which may be misconstrued by hypercritical observers.

It is also significant that through the medium of the American Dental Association, an ever-flowing stream of nourishment is coursing through the arteries of the profession, which we assimilate and pass on to our patients in modern, scientific health service. Through this selective process, the practical usefulness of dentistry has been advanced to the status of a major endowment of the human race. This parent organization jealously guards our rights and precepts, at the same time constantly seeking normal expansion through legitimate channels of research and practical application, leading to a broader concept of ethical relations to meet present-day demands.

Condoning undue license, bordering on innovation, would result in catastrophe to present usage and open our sacred precincts to abuses and disaster. A tendency to raise the spirit of commercialism above professional dictates would become a subtle menace to quality of service and thus wantonly betray the confidence reposed in us. It would engender a militant attitude, aptly illustrated by the functions of the odontoblasts and odontoclasts—the builders and the destroyers.

The ethics of our profession, having evolved from the precepts of the Golden Rule, precludes the possibility of abrogating our time-honored customs without courting complete collapse. While we hesitate to pose as our "brother's keeper," the "voice of experience" would solemnly admonish against the introduction of innovations affecting our true and tried Code of Ethics.

Professional duties have conferred upon me the honor and privilege of giving guidance in ethical relations and deportment to several thousands of students, a majority of whom have become members of the American Dental Association. Observation has been definitely convincing that no young practitioner can successfully stand alone. His greatest privilege is centered in fraternal collaboration through which radiates those imperishable words: "United we stand —divided we fall."

333 Linwood Avenue.

REPRODUCTION OF INDIVIDUAL CHARACTERISTICS OF TOOTH FORM, COLOR AND ARRANGEMENT IN FULL DENTURE PROSTHESIS

By W. Les Warburton, D.D.S., Salt Lake City, Utah

THE reproduction of individual characteristics of tooth form, color and arrangement in the making of full dentures is a sadly neglected part of denture prosthesis. We have all had the experience of delivering dentures that were satisfactory in every way except in appearance, and although the patient was pleased and we expressed pleasure, inwardly we had sensed a dissatisfaction with the esthetic features of the case. The setting up of teeth has been scientifically taught in schools, in textbooks and by clinicians; for example, with the central incisors even, lateral incisors recessed slightly with their incisal tips raised above the occlusal plane and the cuspids prominent. Is that beauty? Is that esthetic? Teeth set according to some stereotyped method do not appeal to my sense of beauty. For the most part, we are producing dentures for patients past middle age, not for those 20 years old. With few exceptions, the mouths of these denture patients have been through a considerable period of destruction and reparation. As the ideal arrangement of natural teeth is so rare, why not make dentures to reproduce natural irregularities? Only as one learns to reproduce individual characteristics of tooth form, color and arrangement can he produce pleasing dentures.

Fauchard, in 1728 (volume 2, chapter 19), in describing the making of his first dentures, says that he succeeded in giving a quite natural appearance to artificial teeth. Our imagination can picture the natural appearance of carved ivory, the surface of which was painted with colored enamels. Some of the products of today can be compared to those of two hundred years ago.

Why has the advancement in esthetics been so slow? Why has the dentist failed to take advantage of all the information that can be derived from the patient prior to extraction?

The fact that such a deplorable condition exists today in the making of "false teeth" can be attributed to the lack of education of the laity and to the indifference of the profession. The process of education of the public lies entirely with the few dentists who are practicing the art of esthetics and in so doing are producing natural appearing dentures. The demand for artistic restorations is ever increasing, and it is the responsibility of the profession to meet the challenge. The indifference of the profession can be attributed to a lack of study of underlying principles and their application; a lack of artistic ability and an inability to obtain satisfactory results.

Esthetics as it applies to full denture prosthesis is both a science and an art—a science because of certain established rules and outlines; an art because of the necessity of applying skill and taste in reproduction according to esthetic principles.

Read before the Section on Full Denture Prosthesis at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 25, 1938.

With the increasing demands for more natural appearing dentures, we find different manufacturers endeavoring to supply new types of molds, contoured and stained teeth, teeth with greater translucency; any of which marks only another step in the advancement of esthetics in denture construction. It is only with the reproduction of individual characteristics of tooth form, color and arrangement that harmonious and artistic dentures can be made.

This paper is concerned only with the patient who is to lose all of his teeth. The presence of any teeth, be it only one tooth, serves as an invaluable aid in the esthetic reproduction of dentures. Every effort should be made to educate the patients and the public as to the benefits to be derived from pre-extraction records. The failure to obtain such records deprives the patient of the best service and at the same time handicaps the operator in his efforts to make finer dentures. The making of complete pre-extraction records should include photographs, masks, profile templates, measurements, impressions, color and form selection and the charting of any defects that might aid in staining and in the reproduction of individual characteristics.

PRE-EXTRACTION RECORDS

Let us assume that the operator has finished all preliminary consultations and examinations and is now ready for the pre-extraction recording. The patient has been sent to a photographer for pictures to be used in the records, the pictures being taken according to instructions to include four views: directly in front (1) with the teeth in gentle occlusion and lips closed, (2) with mouth and teeth open showing the teeth and (3) with the teeth closed as in a broad smile showing both teeth and gums; and (4) the profile view. These prints should not in any way be retouched by the photographer. If the operator wishes, this work can be done in his own office, with any equipment he may possess. The taking of pictures with the smaller cameras can be made a very economical part of the pre-extraction recording. Small films can be enlarged to exact size, this making it possible to use the profile view as a cut-out profile template. For those interested in installing photographic equipment, I suggest consultation with a local photography supply house. Also, articles by E. H. Bruening,[1] B. L. Hooper[2] and C. J. Stansbery[3] should be read.

While the photographs are indispensable records and are easily filed for future use, I believe the mask to be the more helpful from a third dimensional consideration. The making of masks with plaster of Paris is such a difficult procedure that not many operators can use it, but with the advent of hydrocolloids into dentistry, technics and materials have been developed that afford wonderful results with very little effort. The making of masks with the hydrocolloids is a pleasant procedure. Hydrocolloids are known for their lack of adhesive qualities; therefore, no oiling or greasing of the hair, whiskers, lashes or skin is necessary. The only precaution necessary is that on tender skins the temperature of the material be lower than is necessary on less sensitive skins.

Any of the elastic impression materials supplied on the market can be used for mask making. Some recommend heating the material in a gun and applying it directly from the gun, after warming the material enough that it will flow over the surface. Better results are obtained by heating the material in a double boiler and adding enough water to make the material plastic at a temperature tolerable to the skin. With the double boiler method, the material is brushed on the surface and worked into every irregularity, care being observed to brush out all air bubbles.

In full denture work, we are interested only in the lower half of the face. To

make a mask of this section, we cut a hole in a stiff piece of cardboard, fitting this to approximately the desired outline of the mask area. No further preparation is necessary. The fluid hydrocolloid is now brushed on the skin to about one-half inch thickness, care being taken not to obstruct the nasal openings. At first, it is advisable to use tubes of rubber or glass for breathing, but these can be eliminated after a little practice. After a one-half inch layer is built on, a frame of wire can be used in reinforcement for further addition and to increase the bulk of the impression; or with a one-half inch layer of the colloid material applied, a plaster of Paris backing can be made, the colloid going through the cooling process while the plaster is setting. No attempt should be made to remove the mask impression until the whole mass is cooled. It is suggested that by prearrangement, a sign be given by the patient to indicate when the mask material feels cool to the face. After the impression is removed, the cast can be poured in wax, plaster or stone.

Profile templates are made by cutting cardboard to fit the face in the median line. These templates are indispensable and can be made from the photograph exact size record or the x-ray, wire, wax or plaster record. The profile record should be complete from forehead to base of chin, not from the tip of the nose to the symphysis of the chin, as so frequently seen. It should be cut out in detail and checked back to the face to make all necessary corrections. Markings on the profile template can show the incisal edge line of both upper and lower central incisors. These profile records are most valuable as a future check-up of the vertical dimension or collapse of the lips at the median line.

Measurements can be made and recorded of different distances between landmarks, such as the distance from the corner of the eye to the corner of the mouth, from the ala of the nose to the base of the chin, from the incisal edge of the lower teeth to the base of the chin, etc. For this work, several instruments are on the market.

Impressions should be made of both upper and lower teeth, from which study or record models can be poured. These impressions should be of the full dentition and complete as to detail. I have always used the sectional compound method for this work and prefer it to the new hydrocolloid method. However, some operators are having very fine results with the hydrocolloids and their use is to be commended as compared to the old snap wax or compound impression method. The extracted teeth can be inserted in the sectional or the colloid impressions and the model poured with the teeth in natural position; or the original impression is poured in plaster and later a duplicate impression is made of this for the insertion of the extracted teeth. Because extracted teeth have to be kept moist in order to preserve their color, the model is made in plaster and the teeth preserved until such time as the case is under construction. If the case is of the immediate denture type of construction, a study model should be made of the original model by the duplicating process. Too many immediate denture advocates have been using but one model and, on the removal of the plaster teeth in making the set-up, have lost their replica of the natural teeth.

Another invaluable impression is made by molding a piece of modeling compound over the labial surfaces of the anterior teeth with the teeth in centric occlusion. This compound is chilled, removed, trimmed and reheated on the labial surface with flame to a depth of about 2 mm., and replaced. The outer chilled section acts as a base and a detailed impression is made. The compound impression is again chilled, removed from the mouth and poured in plaster. By taking this impression in two sections, right and left, a more detailed impression

is secured of the bicuspid region. Models made from these impressions serve as a definite aid in developing inclination, overbite and overjet of the anterior teeth, but can be eliminated from the pre-extraction records if proper study models are made and mounted on an occluding frame.

I have taken these anterior block impressions for years, not only of prospective denture cases, but also of others, and have used them in my studies of esthetics and tooth arrangement. They serve not only in recording pre-extraction cases, but also in developing ability and skill in building satisfactory dentures. These models can be arranged as to type, age and sex, and used as guides in developing a knowledge of tooth form and arrangement.

MATCHING THE COLOR OF THE TEETH

Much has been written on the color of the teeth, and we all know the difficulty of matching our present shade guides to the natural teeth. In reproduction or imitative art, we deal only with the lightest shade or hue of the tooth and develop the intensity of saturation and darker areas with stains. Therefore, in recording the color, we use the lightest shade whether it is the gingival, middle or incisal portion of the tooth. Recordings are made of each tooth. Sometimes, as many as three, four or more different basic hues must be matched within one mouth. It is this lack of uniformity within colors that helps to build our most esthetic dentures, as compared to the monotony of color in the sets as produced by manufacturers. The selection and recording of shades must be carried out under ideal lighting conditions, the subject of which has been covered extensively in the literature. Mention is made that a north exposure of reflected noonday sunlight that is not intensified by some color object is the ideal light. The daylight blue bulbs of artificial lighting are not to be recommended because they give an unbalanced spectral value. The selection of tooth form can be made from the mouth, or later with the study model and extracted teeth as a guide. Before the patient is dismissed, a detailed charting of all the individual characteristics of each tooth is made, thus completing the pre-extraction recording.

REPRODUCING CONTOUR

Very few molds of manufactured teeth satisfy the desire to reproduce the individual tooth; therefore, in the selection of form, a tooth of sufficient size and of general contour similar to that of the tooth which we wish to reproduce is chosen. The individual characteristics of contour are made by grinding the teeth with stones and finishing with fine carborundum disks. Irregularities of surface, abrasions, defects, contour and size are matched with the individual extracted teeth before either is mounted or set up. In immediate denture construction, this individualistic grinding is matched to the study model and to the natural teeth within the mouth. On completion of the desired contour grinding, the teeth are ready for the wax set-up.

ARRANGEMENT

Each tooth is set in the wax bite-rim in exactly the position of the corresponding natural tooth as governed by the study models, the reproduction of gross irregularities of arrangement being copied as far as desired. The arrangement of the six anterior teeth and first bicuspids is made according to esthetics, the set-up of the second bicuspids and molars being made according to mechanics. Occasionally, the mechanics of the posterior teeth will demand a change in the overbite and overjet of the anterior teeth, this being the result of loss of the posterior teeth and demanding an opening of the vertical dimension. Let us pause here long enough to say that the amount of open-

ing should be determined before extraction. Impressions, photographs and the profile template are made with bite-blocks of compound built between the molar teeth at the desired opening.

The set-up should now be transferred to the mouth for trying in, to assure satisfactory tooth form and arrangement. When any changes are made, reference is made to photographs, mask and profile template to determine the facial and lip contour.

STAINING AND GLAZING

The next step in the reproduction of individual characteristics is the staining and glazing of the porcelain teeth.

There is no branch of dentistry in which the artistic sense can be more highly developed than in the art of staining and coloring porcelain. Porcelain work cannot be practiced successfully and completely unless staining and glazing are employed to some extent. Yet mineral staining is an art complete in itself and should be practiced by all denture specialists and general practitioners regardless of their ceramic endeavors. With a little experience and understanding of the underlying principles, one may develop this work to a surprisingly high degree of perfection. What may have seemed difficult and indeed beyond the realm of possibility, with practice is mastered, and the results are gratifying even when the work is done in a crude or indifferent way.

Preparation of Teeth.—The teeth, having been approved as to arrangement, are removed one by one from the wax set-up, the operator making sure that the indentation of each tooth is retained in the wax. The teeth are scrubbed with soap and a stiff bristle brush, boiled in "Gold Dust," and finally bathed in chloroform, to remove all foreign matter. The teeth must be clean. To make certain of this, the operator should examine them under a magnifying glass. If the teeth show pits, these pits should be filled by rubbing dry glaze powder over the surface before the first coat of glaze is applied. The porcelain teeth of some manufacturers are more dense than those of others, and it is recommended that after tests a choice be made, the teeth of greatest density being selected. Before any staining is done, all ground surfaces should have one coat of glaze to close the pores.

As stains are often associated with defects in the surfaces of the tooth, any defect can be accentuated by the use of the proper stain. Let me emphasize the point that to have artistic staining, natural contour and defects must be reproduced.

Color Discrimination.—The dentist must have a thorough knowledge of color, its saturation, shade and dependence on illumination, as well as the influence on it of the complexion and clothing. As our skill and understanding of this problem are developed, we experience the joy and satisfaction of success. Much has been written on this subject. I refer to articles by E. B. Owen,[4] F. H. Orton,[5] Bruce Clark,[6] J. E. Argue[7] and many others.

Color Mixtures.—The general rules that cover all combinations of colors as exemplified in oil and water colors apply to the mixture of porcelain stains. Mixed very thin, they produce a mere tinge of color. Increasing the proportion of powder intensifies the saturation of color accordingly. They can be used individually or mixed in combinations to produce secondary colors and variations lighter or darker. Thus, blue and yellow will produce different shades of green according to the proportions in which the two are mixed; black and white will give grays; gray and green will make olive green, and so on. If the tone of the tooth is yellow, the addition of brown will at first darken the yellow, then, as more and more is added, the tooth will be changed to brown. If the tone of the tooth is blue or gray, brown will at first merely deepen the blue or gray, but, on

the addition of considerable brown, the tooth will become a decided brown. A point to remember is that it is easier to darken a color than it is to lighten it.

Manipulation of Stain and Glaze Powders.—Mineral stain powders are supplied in several types as to temperature, the lowest at 1500° and the highest at 2450°. I have found no satisfaction in using the 1500 or 1600° stains as supplied on the market. The 1762 to 1900° stains have served my purpose with satisfaction. By the addition of the proper amount of low-fusing glaze powder, these stains can be made to mature at the desired temperature. The stains are mineral oxides incorporated with a powder similar to glaze powder. By the addition of low-fusing glaze powder, the fusing temperature or flow can be regulated. For opaque white, I recommend C. P. tin oxide, which, being a flat white, should be blended with any of the other colors or with a small amount of glaze before it is applied to the tooth.

If the stain is to be blended and flowing is desired, glaze powder is mixed with the stain, but if no flowing is desired as in hairline checks or stained margins, no glaze is added.

The powders, whether stain or glaze, are thoroughly spatulated with a medium of distilled water, glycerin and water of equal parts, or with "super stain medium." In dry climates, the use of distilled water is very impractical because of its rapid evaporation. I have a preference for "super stain medium" diluted about one-third with distilled water. An agate spatula is used because the powders may abrade a metal spatula, with detrimental contamination resulting. It is suggested that one minute be utilized in spatulation of each mix and that all the powder on the slab be incorporated in the mix.

For further study of the application of stains and glazes, I recommend the article by Irving R. Hardy.[8]

Firing of Stains and Glazes.—In firing diatoric teeth, it is preferable to mature the stain at approximately 1750 to 1800°; but with gold clad pin teeth, the maturing temperature is from 1700 to 1725°. In ceramics, there is the rule that temperature plus time controls the bake of the porcelain. As the same rule applies to stains and glazes, the temperature of each successive firing of stain or glaze should be slightly lower than the preceding firing. Overheating tends to fade the stains. Some will say that 1700° is too high a temperature for firing gold clad pin teeth. With the proper packing of the pins, no trouble need be experienced by the melting out of the solder or over-oxidizing of the pins. Fine asbestos can be packed in the space surrounding each pin. Rouge and chloroform can be used; gold foil can be handpacked within the same space, or high heat crown and bridge investment can be used to completely cover the pins. These investments can be used to set all six anterior pin teeth and fired as one unit, the investment block serving as a protector of the pins and as a holder and tray at the same time. If the pins are not completely covered with investment protection, they should be entirely submerged in fine silex while within the furnace. For convenience and safety of pins, some manufacturers are supplying, at little extra cost, platinum pin teeth made especially for staining and glazing. After all staining is completed, a final application of glaze is made, serving as an added protection in polishing the dentures, as well as giving depth to the stain. Glaze must not be applied over the surface in synthetic porcelain reproductions, because the finish should be left dull.

We should not hesitate to reproduce reparative work such as synthetic porcelain fillings, gold inlays, foils or bridgework. Excellent results are obtained by pounding gold foil in a natural location and then staining the margins to show defects.

Only as we imitate the defects and

characteristics of an individual case can we expect to have a natural appearing denture; and only as we develop skill and ability to imitate can we expect to create an esthetic denture.

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DISCUSSION

Bert L. Hooper, Lincoln, Nebr.: Dr. Warburton's paper deals with a vital subject in dentistry. The regard, or disregard, for this subject may mean the difference between a busy operator and one who has time to spare; it may mean the difference between satisfied patients who speak words of praise at every opportunity and those who are dissatisfied; it may mean the difference between success and failure.

Dr. Warburton, speaking of pre-extraction records, states: "I have used them for years in my studies of esthetics and tooth arrangement. They serve not only in recording pre-extraction cases, but also in developing ability and skill in the building of satisfactory dentures." This is a most important point. Not only are pre-extraction records of inestimable value in the construction of successful dentures, but they are also of inestimable value to the dentist if he will study them, and thus develop ability and skill, as well as a keener appreciation of esthetics, which in turn means satisfied, comfortable, happy patients; and that is success.

Sometimes, many of us feel mystified as we approach the problem of esthetics; and I am glad that the door has been left wide open for all of us by Dr. Warburton's words: "What may have seemed difficult and indeed beyond the realm of possibility, with practice is mastered, and the results are gratifying even when the work is done in a crude or indifferent way." After all, it seems to me that even Nature does a few rather crude jobs. With this hope held out to us, why not put forth more effort toward better esthetic results?

Another statement which I like is this: "As our skill and understanding of this problem are developed, we experience the joy and satisfaction of success."

It seems unnecessary that we, as a professional group, should be challenged to do the things that are a benefit not only to our patients, but also to ourselves from every point of view; nevertheless, Dr. Warburton, in his experience with his co-workers, feels impelled to state that "it is the duty of the profession to meet the challenge and deliver more esthetic dentures." He says further, "The indifference of the profession can be attributed to a lack of study of underlying principles and their application, a lack of artistic ability and an inability to obtain satisfactory results." His methods and procedures are sound and he has been kind enough to permit us our own peculiar ideas, provided the goal remains, more natural artificial dentures.

I. R. Hardy, New York City: As a member of the group who have devoted considerable time and effort in seeking to promote an appreciation of esthetics in denture construction, I congratulate Dr. Warburton. His is a voice crying in the wilderness, and while his message is

laden with advice and counsel, it will be heard by comparatively few and heeded by fewer still. The dental journals will continue to carry blandishing advertisements with beautiful pictures in color advising the profession of the unparalleled merits of artificial teeth which they modestly admit equal and sometimes inferentially suggest surpass Nature's own.

Then why bother with anything different? "Besides, patients like small white teeth; you can do that kind of work in your practice, but mine would not stand for it," and so on! But Dr. Warburton is, I know, deriving great satisfaction from his artistic efforts, and is at the same time rendering a distinct service to his patients, and, incidentally, to the profession.

The technic he describes is substantially the same as that I employ in seeking the result which he attains. There are one or two points perhaps that I might add or repeat for the purpose of emphasis. In selecting molds for use in dentures, I avoid flat labial surfaces. There are many of these flat-surfaced teeth on the market and, I'll admit, there are some flat labial surfaces in natural teeth. However, natural and artificial teeth are very different in light-absorbing and light-reflecting qualities. Flat-surfaced artificial central incisors especially tend to reflect the light in an unnatural manner; they are too mirror-like and hence attract undue attention.

In modifying the teeth by grinding, the effect should be exaggerated slightly, for if we are too subtle in our efforts, the effect will be almost entirely lost when the teeth are in the mouth. The same precaution may be given in the application of the colors in staining. Apply them fairly boldly, for the effect in the mouth will be greatly minimized by the shadows of the lips and surrounding tissues. If diatoric anterior teeth are used for staining, there is no worry about pins and, hence, no need to protect them. If pin teeth must be used, platinum pin types may be secured.

I can see little difference in the various makes or fusing points of stains: they are all good when handled properly and fairly good even when somewhat abused.

In reproducing fillings, the compound types, mesio-incisal or disto-incisal, are most effective and the lateral incisor one of the best places to insert them.

Dr. Warburton has covered the field in so thorough a manner that I can add nothing further. I do want to compliment the author on his energy and resourcefulness in choosing an orphan branch of the dental art for his own and to urge him to persist in his efforts. He is doing it the hard way; but do not for a minute pity him: he's having fun!

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THE COUNCIL ON DENTAL EDUCATION

AT the New Orleans Meeting in 1935, a committee on dental education was appointed by the American Dental Association. This committee was instructed to conduct a survey of the educational status of the profession, with a view to fulfilling the provision of the Constitution and By-Laws of the Association, which declares as one of the purposes of the association the obligation "to elevate and sustain the professional character and education of dentists"—a purpose and an obligation that have from the origin of the dental school been delegated almost entirely to the educational institutions.

This is not the first effort on the part of the profession to exert a directive control over the trend of dental education. In 1909, there was created the Dental Educational Council of America, representing the interests of the schools, the examining bodies and the lay profession. The Council has, for many years, capably and creditably acted as the mentor of dental education and has done much toward standardizing dental education, and to this body, its achievements and professional ideals, the profession owes its present high standards of dental education.

The American Dental Association, some years ago, realizing the need and desirability for a body representing all educational interests, and particularly the American Dental Association as the corporate body responsible for the status of dentistry, began to take steps to create a representative educational body empowered to exert a definite directive influence upon the evolution of dental education.

The first effective step in that direction was the appointment of the Committee on Dental Education. This Committee conscientiously and intelligently pursued its work and made its first report at the San Francisco meeting. Its findings fully justified the subsequent recommendation to establish a council on dental education.

The essence of this first report was to the effect that "Based upon the conclusion developed from considerable study of certain phases and conditions existing in various dental educational institutions and infirmaries of the country, your committee recommends the establishment of a council on dental education and infirmaries." And, in the desire to stimulate the adoption of remedial measures, the report continued, "We believe that such a council on dental education and infirmaries created by and responsible to the American Dental Association can become an effective agency in promoting high standards among the dental educational schools of the country."

Pursuant to the above recommendation and as the agency representing the three educational bodies of the dental profession, the American Dental Association, through its Board of Trustees, has taken unto itself the responsibility of directing the educational development of dentistry by the appointment of a Council on Dental Education constituted as follows: A. W. Wherry, Salt Lake City, chairman; W. M. Morgan, Nashville, and M. W. Prince, Detroit, representing the American Dental Association; L. M. S. Miner, Boston, vice chairman; J. T. O'Rourke, Louisville; J. Ben Robinson, Baltimore, representatives of the American Association of Dental Schools; M. J. Terry, Albany, secretary pro tem.; Robert L. Sprau, Louisville, and William F. Bell, Asheville, as representatives of the National Association of Dental Examiners.

The American Dental Association has appropriated sufficient funds for the operation of the Council, and the stage is now set for a functioning supervisory sponsorship of dental education that should result in developing a dental educational system that will meet the demands of the momentous evolutional changes occurring in the practice of dentistry today.

The Council on Dental Education has formulated a statement of its aims, policies, principles and criteria as published in full in another section of the present issue, the principal and fundamental aim being stated in the opening item of its credo; namely, "To correlate in accord with the evolution of scientific knowledge, clinical experience, and social and economic conditions, the procedures of dental education, with the problems involved in meeting oral health needs, and to interpret the relations of dental education to the dental profession and to the public."

The men composing the Council are all thoroughly familiar with the difficulties which have had to be met and overcome in the course of the development of our present system of education, and they are equally familiar with the shortcomings of the system.

The individual development of dentistry educationally, it being separate and distinct from other specialties of the healing art, makes our problem an even more difficult one than the education of those who are to undertake one of the distinct specialties; and, too, since the development of the biologic relationships of dentistry, we have been faced with the necessity of developing a foundational system of dental education that includes practically all of the fundamental sciences of medicine.

The result has been remarkable in that we have devised and applied a system which we believe better qualifies the novitiate to pursue his chosen field than is the case in any of the distinct medical specialties.

One of the difficulties of the system, however, has been the thought and hope of a standardized procedure that would settle for all time the character and content of the dental curriculum. Dental educators have long since realized that such a goal is unattainable because of the necessity of flexibility in dental education, as is the case with any education that is founded on incremental accumulation of knowledge impelled by a continuously broadening scope of activity. It is this broadening scope and the constantly enlarging health relations of dentistry that preclude the possibility of dental education and the dental curriculum ever becoming static.

Dental education in its broadening scope is continually extending its horizon and, as its horizon extends, a broader and more extensive knowledge of its own and related sciences is demanded. This broadening horizon has created a double entente in dental education that has and still threatens a complete metamorphosis of the ideals and practice of dentistry; in that dentistry demands a technical skill beyond any other health service, as well as an intimate knowledge of the relation

of dental service to practically all physiologic and pathologic conditions of the body as a whole.

One group of the new Council is in full knowledge of the necessity of flexibility in the dental curriculum. Another is familiar with the clinical aspects of practice, and a third group, with legal relations of the novitiate to the profession and to the public—and all three of these groups have entered upon the work of the new Council in the spirit of those old pioneers who set out to build a profession from a trade. And if the new council can succeed in its task to the degree of our revered pioneers, they will have served well the ideals, the aims and the purposes of dentistry.

As an earnest of the sincerity of purpose of the Council, their very first official act has been to set aside the system of classification long in vogue, a system that begot jealousy and invidious comparisons that were odious indeed.

The constantly changing character of dental practice compels a definite progressive educational effort on the part of the novitiate as well as the practitioner. The presumedly finished education of the graduate cannot be "finished" in the sense of being complete: it involves a continuous effort to keep abreast of the increasing growth of knowledge after his school years.

As one of the remote aims of dental education, the dental student not only should be prepared to *begin* the practice of dentistry, but also should be mentally equipped to develop into an intellectually minded professional man capable of adjusting and adapting himself to the changing conditions to be encountered after graduation; one who will increase in efficiency and proficiency because of his ability to take from the stream of knowledge, which research will continue to pour into our field, that which is necessary and desirable to improve dental health service. These are some of the remote aims of dental education from which dental education and its recipients have been diverted by virtue of the necessity of attention to immediate ends. The statement of the Council recognizes the desirability and necessity of consideration of both the remote and the immediate ends by regarding these as significant aims of dental education.

The entire statement of the aims, ideals, purposes of the Council reflects a seriousness of purpose which promises a refreshened idealism for dental education, the attainment of which will place dentistry on the level to which we have aspired from the beginning of our organization as a worthwhile public health service.

COUNCIL ON DENTAL THERAPEUTICS

GRA-ERN DENTAL CREAM—NOT ACCEPTABLE FOR A.D.R.

REPORT OF THE COUNCIL ON DENTAL THERAPEUTICS OF THE AMERICAN DENTAL ASSOCIATION*

THE following report was sent to the Gra-Ern Products Company in order that the firm might have an opportunity to present adequate reasons for revision of the report. In its reply to the Council's report, the firm set forth, in essence, that (a) the Council's report is inaccurate in that the report of the Bureau of Chemistry does not indicate the true nature of the product. Among other things, the firm stated that the product does not contain "sulphate ash" and that no other types of ash are used as a portion of the formula, and (b) the claims for the product have been substantiated, in proof of which the firm submitted excerpts from several alleged testimonials and magnifications of three x-ray pictures, unaccompanied by information necessary for interpretation.

The Council has concluded, after careful consideration of the firm's reply, that the evidence presented is inadequate and does not constitute cause for revision of the report. The report is therefore presented for the information of the dental profession.

In December 1937, the Gra-Ern Products Company, of Shreveport, La., submitted Gra-Ern Dental Cream to the Council. The firm failed to reveal the composition of the product, and wrote:

> We know it is a custom to submit formula with anything new, but on account of our efforts to secure patents, which we are led to believe is possible, as well as the possibility of a serum, you can readily realize under the circumstances the impossibility of such a submittal.

As far as the Council is aware, the firm's efforts to secure patents have not met with success, nor did analysis of the product reveal the presence of protein, which might be expected to be present if Gra-Ern Dental Cream contains a serum.

The dental profession will be interested in the following claims made by the Gra-Ern Products Company, particularly in view of the findings of the Bureau of Chemistry:

> Hundreds of cases under X-ray and observation, have definitely proven we have a product with unusual merit. The surprise to everyone that has witnessed the act, said act consisting of the magnifying of X-ray pictures made of a pyorrhea subject in approximately three week periods, is the seemingly reestablishment of the destroyed bone structure. Shocking, yes, but we believe you will agree that the X-ray does not lie.
>
> We believe our product is worthy of a test by you, in extreme sore diseased gums, loose teeth, bleeding and pus secreting gums, watch the re-action, we earnestly believe that you too will praise the results of great effort and research that has been made to produce this unusual product.

Although advertising circulars accompanying trade packages of the product

*Authorized for publication.

vary from time to time, the following material contained in a recent circular is typical of the claims made for Gra-Ern Dental Cream:

"Approximately 85% of the American people are suffering from decayed teeth and diseased mouth." [Quoting leading national dental authorities.]

IT IS NECESSARY THAT YOU READ THIS TO FULLY ENJOY AND APPRECIATE GRA-ERN DENTAL CREAM "THE MODERNIZED TOOTH PASTE"

Rinse your mouth thoroughly with water. Place on your brush a portion of Gra-Ern Dental Cream NO LARGER THAN A PEA. Brush teeth with a slow gentle rotating motion, never striking gums or mouth tissue with bristles of brush.

The lovely foam created penetrates into every crevice of the teeth removing decaying food deposits that cause teeth to decay. Polishes and brightens the teeth in a manner delightful to users. Retards the formation of tartar, removes nicotine stains.

To the fortunate few who are free of decaying teeth and mouth disease, Gra-Ern Dental Cream offers a protection of inestimable value.

Do not be deceived by thinking because your teeth are white that the underlying bone must be in a healthy condition. Often the finest looking set of teeth are feeding from their base poisonous matter into the body causing numerous ills.

IMPORTANT

Gra-Ern Dental Cream has a tendency to open the pores of gums and mouth and in so doing brings to the surface the poisonous substances created by diseased conditions. Such substances are of a nature that often for the first few days the user of Gra-Ern will feel a tenderness of the gums and mouth tissues. This condition generally disappears within three days. To people with diseased conditions of mouth and gums we again state, "USE ONLY A SMALL AMOUNT OF GRA-ERN DENTAL CREAM on your brush, then use brush in proper manner."

GRA-ERN DENTAL CREAM

is a MODERNIZED TOOTH PASTE. Plus its marvelous cleansing and polishing values, it has proven a blessing to those suffering from Pyorrhea, Sore Bleeding Gums and loose teeth. Continual use of Gra-Ern over a period of time is the proven method that has secured amazing results for serious diseased mouth conditions.

Gra-Ern is free from injurious acids, poisons, and chemicals, it is made up of the purest ingredients, it is scientifically compounded from a formula that was perfected after a score of years of research and laboratory tests. Children continually using Gra-Ern Dental Cream should lead a happier and healthier life.

GRA-ERN PRODUCTS COMPANY

2423 Southern Avenue Shreveport, Louisiana
Ref. No. 379-C
Louisiana Bureau of Food and Drugs
(End of circular)

The Gra-Ern Products Company has not submitted evidence to substantiate these claims.

REPORT OF THE BUREAU OF CHEMISTRY

Three tubes of Gra-Ern Dental Cream, one of which was supplied by the manufacturer, the other two of which were purchased on the open market, were submitted to analysis. The cartons bore the following:

Science's Answer to a Great Need
GRA-ERN
Private Formula
Dental Cream
A Marvel for Teeth
and Gums

Gra-Ern Products Co.
Shreveport, La.
Price 65c

The tubes bore the same description in addition to directions for use.

Each tube of about 50 cc. capacity contained an easy flowing, grayish white mass with an odor resembling that of horehound candy. Qualitative tests indicated the presence of calcium, sodium, carbonate, soap, borate and traces of sulfate. Phosphate, protein, glycerol, heavy metals, potassium, phenol and chlorate

were not found. Solubility tests in water indicated the absence of large quantities of insoluble material.

Quantitative analysis yielded the following:

Per cent solid (dried at 100)	23.72
Per cent sulfated ash	14.00
Per cent ash	7.80
Per cent calcium	2.11
Per cent sodium	1.74
Per cent water soluble borate (as $Na_2B_4O_7$)	1.58
Per cent water	75.87
Fatty acid (per 100 gm. paste) equivalent to 55.41 cc. NaOH (1N)	

(End of Chemist's report)

From the foregoing, it may be concluded that a product essentially similar to Gra-Ern Dental Cream may be made from water (75.87 per cent), sodium tetraborate (1.58 per cent), soap (16.97 per cent), calcium carbonate (5.28 per cent), flavoring and sweetening agents.

Gra-Ern Dental Cream, Gra-Ern Products Company, is a dentifrice of secret composition which is promoted with exaggerated and unwarranted therapeutic claims. It is, therefore, declared inadmissible to the list of accepted dental remedies.

A copy of the rules that govern the Council in the consideration of articles will be sent on request.

HAROLD L. HANSEN, *Secretary.*

DEVELOPMENT OF PUBLIC INTEREST IN DENTAL PRODUCTS

DURING the past year, the number of lay inquiries on dentifrices, mouth washes and other dental products advertised to the public has increased to a marked degree. Of particular importance is the fact that many of these inquiries come from teachers and students interested in what is variously called "consumer education," "good buymanship" and the like. That this "consumer" movement is gaining momentum was also shown by the surprisingly large and enthusiastic attendance at the National Conference on Consumer Education held at Columbia, Mo., early in April.

While the major emphasis in this type of education is placed upon economic considerations, it is apparent that a desire for basic information on the art and science of dentistry motivates many of the inquiries directed to the Council office. The information supplied, if it is to be worthy of the name, must of necessity come from an unbiased, competent and authoritative source. Otherwise, gratuitous "information" of a sort designed to sell this or that product and subtly flavored with misinformation may be offered in its stead. It is clear that economic considerations alone as these are expressed in terms of relative prices for consumer goods are insufficient for the public need. The public should be informed concerning both goods and services and, further than that, should be guided in the selection or rejection of either or both as indicated by their needs. Ethical principles and unselfish service, characteristic of the profession, are of at least as great importance as economic principles.

This growing interest in matters related to dentistry is apparently but an expression of an increasing public awareness of the need for unbiased information on dental services and on "dental" commodities.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Local Anesthetics*

Procaine Solution 2% with Epinephrine 1:30,000-Anestex Brand: Each cubic centimeter is stated to contain procaine, 0.02 gm; synthetic epinephrine bitartrate, 0.00003 gm. (as base); chlorbutanol (chloroform derivative), 0.005 gm.; sodium chloride, 0.0066 gm.; potassium sulfate, 0.0033 gm.; sodium thiosulfate (anhydrous), 0.0010 gm.; sodium bisulfite (anhydrous), less than 0.00067 gm.; in distilled water.

Manufactured by the De-Ce Products of New York. No U. S. patent. U. S. trademark (Anestex Brand) No. 181,821 (March 25, 1922).

Procaine Solution 2% with Epinephrine 1:30,000-Anestex Brand in Injectubes, 2-2.5 cc.

Procaine Solution 2% with Epinephrine 1:30,000-Anestex Brand in Ampules, 2.5 cc.

Procaine Solution 2% with Epinephrine 1:30,000-Anestex Brand in Ampules, 3.5 cc.

Procaine Solution 2% with Epinephrine 1:60,000-Anestex Brand: Each cubic centimeter is stated to contain procaine, 0.02 gm.; synthetic epinephrine bitartrate, 0.000015 gm. (as base); chlorbutanol (chloroform derivative), 0.005 gm.; sodium chloride, 0.0066 gm.; potassium sulfate, 0.0033 gm.; sodium thiosulfate (anhydrous), 0.0010 gm.; sodium bisulfite (anhydrous), less than 0.00067 gm.; in distilled water.

Manufactured by the De-Ce Products of New York. No U. S. patent. U. S. trademark (Anestex Brand) No. 181,821 (March 25, 1922).

Procaine Solution 2% with Epinephrine 1:60,000-Anestex Brand in Injectubes 2-2.5 cc.

Procaine Solution 2% with Epinephrine 1:60,000-Anestex Brand in Ampules, 2.5 cc.

Procaine Solution 2% with Epinephrine 1:60,000-Anestex Brand in Ampules, 3.5 cc.

Procaine Solution 2% with Epinephrine 1:25,000-Dentocain Brand: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00004 gm.; sodium bisulfite, 0.0015 gm.; sodium chloride, 0.00375 gm.; potassium chloride, 0.0001 gm.; distilled water to make 1 cc.

Manufactured by Endosol Laboratories, New York City. Distributed by Dentocain Company, New York City. No U. S. patent or trademark.

Procaine Solution 2% with Epinephrine 1:25,000-Dentocain Brand in Cartridges, approximately 2 cc.

Procaine Solution 2% with Epinephrine 1:50,000-Dentocain Brand: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine, 0.00002 gm.; sodium bisulfite, 0.0015 gm.; sodium chloride, 0.00375 gm.; potassium chloride, 0.0001 gm.; distilled water to make 1 cc.

Manufactured by Endosol Laboratories, New York City. Distributed by Dentocain Company, New York City. No U. S. patent or trademark.

Procaine Solution 2% with Epinephrine 1:50,000-Dentocain Brand in Cartridges, approximately 2 cc.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. 1938, page 36.

ASSOCIATION ACTIVITIES

COMMITTEE ON LEGISLATION

MAIL ORDER DENTURES ILLEGAL

THE issuance of a fraud order by the United States Post Office Department, based upon charges of fraudulent use of the mails, brought by the postal authorities against Sylvan B. Heininger, manufacturer and seller of dentures by mail, has been sustained by the Court of Appeals of the District of Columbia in a decision rendered on Monday, April 17.

This decision overrules the opinion rendered by Judge Peyton Gordon of the District Court of the United States for the District of Columbia. Judge Gordon had said, "I have examined the transcript of the testimony before the Post Office Department as well as the memorandum of the solicitor of the Post Office Department, and I am of the opinion that there was no substantial evidence before the Post Office Department to sustain the decision that plaintiff was engaged in conducting a scheme or device to obtain money through the mails by means of false or fraudulent pretenses, representations or promises. . . ."

Such an opinion was deplored by the ethical members of the dental profession, and Dr. A. B. Patterson, chairman of the Legislative Committee, was moved to comment that "The ruling of Judge Gordon . . . will be read with mixed feelings of amazement and bewilderment by the 60,000 dentists of the United States who take pride in their profession, its attainments and ethics."[1]

The decision of the Court of Appeals is in accord with the opinion of the dental profession that such practices are fraudulent and very inimical to the best interests of the public. It is consistent with the attitude expressed in the famous case of Semler v. Oregon, in which Chief Justice Hughes, speaking for the United States Supreme Court, stated: "The community is concerned with the maintenance of professional standards which will insure not only competency in individual practitioners but protection against those who would prey upon a public peculiarly susceptible to imposition through alluring promises of physical relief, and the community is concerned in providing safeguards not only against deception, but against practices which would tend to demoralize the profession by forcing its members into an unseemly rivalry which would enlarge the opportunities of the least scrupulous."

Comment on this decision of the Court of Appeals, and, if possible, the complete text, will be published in the next issue of THE JOURNAL as it is considered of great import to the public and the profession.

1. J.A.D.A., 25:1151, June 1938.

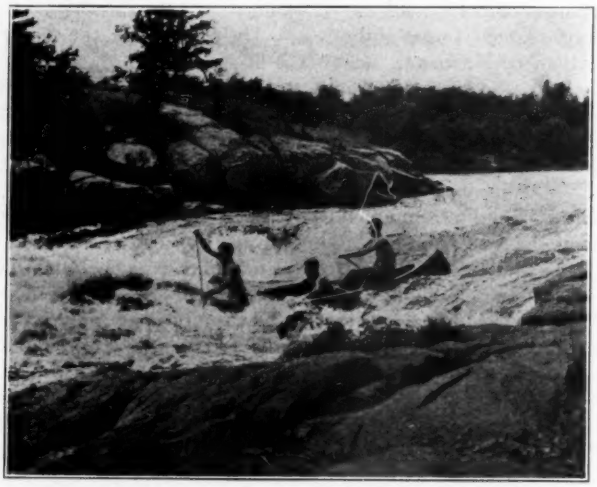
AMERICAN DENTAL ASSOCIATION

Milwaukee, July 17 to 21, 1939

MILWAUKEE, the scene of the eighty-first convention of the American Dental Association, apparently is a city air-conditioned by Nature.

Reports from the Milwaukee Association of Commerce insist that the average temperature for the month of July in this growing metropolis on the western shore of Lake Michigan is 70.5 degrees; so all indications point to a comfortable meeting of the A.D.A. from July 17 through July 21.

It is truly a convention city, offering its visitors complete auditorium, hotel, restaurant and entertainment facilities, as well as being one of the outstanding recreation cities of the United States. Milwaukee officials are aware that the stimulation of good entertainment and recreation after exacting convention sessions is a necessary part of a convention program.



Canoeists running little falls on Flambeau River. The Flambeau offers everything a vacationist could wish: beauty, boating and a variety of fishing.

Milwaukee is located at the confluence of the Milwaukee, Menomonee and Kinnickinnic rivers, 85 miles north of Chicago. Incorporated in 1846, the city grew by leaps and bounds from hamlet proportions in 1850, to take its rank today as the thirteenth largest city in the United States. It has a population of 624,243.

Theaters in Milwaukee feature current attractions. The musical offerings are selective and varied. Milwaukee has restaurants and cafes of every type and many of them are famous for the excellence of their food. Quaint beer gardens are reminiscent of the days when Milwaukee's fame was built around this beverage.

For those who want sport and action, there are excellent golf courses; numer-

ous tennis courts; bathing beaches on Lake Michigan; the rivers and nearby inland lakes, and activities at Milwaukee's beautiful lake front, including motor boating, yachting and colorful water pageants. In addition, the sport minded convention visitor will find polo and horse shows, baseball games and automobile and motorcycle races.

Washington Park is the city's pride and joy. The park boasts the largest municipally owned zoo; a beautiful horticultural exhibit and sunken gardens, and golf courses, swimming pools, dance pavilions, concerts and song festivals.

Milwaukee assures the members of the American Dental Association that whatever they choose to do, they will have a good time, for "Milwaukee has a brand of hospitality which sees that every one is provided for—a pleasant natural manner of leading the way to individual enjoyment."

AMERICAN DENTAL ASSOCIATION AND NATIONAL BUREAU OF STANDARDS WORKING TOGETHER TO INSURE LONGER LIFE FOR TEETH

THE American Dental Association, as the result of research at the National Bureau of Standards, announced in its November journal a list of dental products which have been tested at the Bureau and found to be of high quality.

This announcement, according to Dr. Wilmer Souder, chief of the Bureau's Thermal Expansivity, Dental Research and Identification Section, should be "of supreme value to all those who are the victims of the ravages of dental decay." Trade names of dental cements, amalgam and gold alloys, tooth-matching filling cement (commonly know as porcelain) and numerous accessory materials were included in the list, and thereby any difficulty which may arise for the dentist in selecting the best restorative materials was eliminated.

This list represents one of the achievements of twenty years of research by the Bureau, during ten years of which it has had the active and financial assistance of 45,000 members of the American Dental Association. The Bureau began, in 1919, to show the glaring defects of some of the more extensively used filling materials. In 1928, the profession joined forces with the Bureau, and together they have waged a relentless war against the defective materials which have been sold to the dentist under the guise of the "best," the "latest" or the "most expensive."

The more reliable manufacturers have gradually come to a realization that this research, if competently directed and made available to the dental profession, will afford perfect protection against the hitherto uncontrollable ravages of dishonest competition. The guarantee that each lot of the labeled product meets every requirement of the specification set up by the Bureau has been made by the manufacturers whose products are listed.

This program reaches from the manufacturer to the consumer and is helpful to all concerned.—Release by Secretary Roper of the Department of Commerce.

American Dental Association
Milwaukee, Wisconsin July 17-21, 1939

HOTEL RESERVATIONS

To secure hotel accommodations for the 1939 Session, consult the rate list and fill out the attached blank. Mail this immediately to the hotel of your first choice or to the Housing Committee, Room E, Hotel Schroeder, Milwaukee, Wis. Confirmation will be sent to you by the hotel.

Second and third choices of hotel should be indicated. If the reservation cannot be made at any of the hotels of your choice, the Housing Committee will place you in as favorable a hotel as possible and will notify you.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed upon, please write or wire the hotel releasing the room, in order that it may be available for other members.

RAILROAD FARES TO MILWAUKEE

Because of the reduced regular rates and round-trip fares, there is no longer any arrangement for convention rates and, therefore, there will be no convention certificates available as in the past. The new low rates for passage in Pullmans and the lower rates for travel in coaches will be in force. Summer excursion rates will be available from some sections of the country. Inquire of your station agent as to the most economical fare.

APPLICATION FOR HOTEL ACCOMMODATIONS

AMERICAN DENTAL ASSOCIATION

Milwaukee, Wis. July 17-21, 1939

HOTEL.....1st choice

HOTEL.....2nd choice

HOTEL.....3rd choice

Kindly reserve the following: ☐ Single Room ☐ Double Room ☐ Twin Beds.

.....Rooms with bath for.....persons $.....per room

.....Rooms without bath for.....persons $.....per room

Arriving on July.....at.....a.m.....p.m.

ROOMS TO BE OCCUPIED BY:

NAME	ADDRESS IN FULL
.....	.....
.....	.....
.....	.....

NOTE TO HOTEL NAMED AS FIRST CHOICE: If the hotel of first choice is unable to make the reservation requested, this application should be forwarded at once to the Housing Committee, Room E, Hotel Schroeder, Milwaukee, Wis.

SCHEDULE OF RATES

ALL ROOMS WITH BATH*

Hotels	Single	Double	Twin Beds
ABBOT CREST 1226 W. Wisconsin Ave.	$2.50	$4.00	
AMBASSADOR 2308 W. Wisconsin Ave.	3.50	5.00–6.00–7.00	$5.00
ANTLERS 618 N. 2nd St. (Connecting shower only)		3.00	
ASTOR 924 E. Juneau Ave.	3.00	6.00	7.00
BELMONT N. 4th and W. Wells Sts.	2.00	4.50	5.50
CARLTON 1120 N. Milwaukee St.		3.50	6.00
GLOBE 803 E. Wisconsin Ave.		3.50	
JUNEAU 811 E. Wisconsin Ave.		3.00–3.50	
KILBOURN 624 N. Third St.		4.50	
KNICKERBOCKER 1028 E. Juneau Ave.	3.00–4.00	5.00	6.00–7.00
LA SALLE 729 N. Eleventh St.		5.00	8.00
MARQUETTE APARTMENT HOTEL 1628 W. Wisconsin Ave.		3.00	5.00
MARTIN 707 E. Wisconsin Ave.	2.50–3.00	4.00	5.00
MARYLAND 625 N. Fourth St.	2.50–3.00	4.00–4.50	5.00
MEDFORD 605 N. Third St.	2.50–2.75–3.00	3.50–3.75–4.00	5.00
MILLER 723 N. Third St.	2.25–2.50–3.50	3.50–4.00–5.00	5.50
MILWAUKEE ATHLETIC CLUB 758 N. Broadway	4.00		7.00
PFISTER 424 E. Wisconsin Ave.	3.00–3.50	5.00	6.00–7.00–8.00
PLANKINTON 609 N. Plankinton Ave.	3.00–3.50–4.00	4.50–5.00–6.00	5.00–6.00–8.00
PLAZA 1007 N. Cass St.	3.00	4.00	5.00
RANDOLPH N. Fourth St. and W. Wisconsin Ave.	2.50–3.00	3.50–4.00	5.00–6.00
REPUBLICAN 907 N. Third St.	2.50	3.50	4.00
ROYAL 439 W. Michigan St.			5.00
ST. LAWRENCE 1026 N. Jackson St.	3.00	4.50	
SCHROEDER 509 W. Wisconsin Ave.	3.50–4.00–5.00–7.00	6.00–7.00–8.00	6.00–7.00–8.00–10.00
SEVEN SEVENTY MARSHALL	3.00	4.50	
SHORECREST 1961 N. Summit Ave.		5.00	6.00
TOWER 716 N. Eleventh St.	3.00	5.00	5.00–6.00
WISCONSIN 720 N. Third St.	3.00–3.50–4.00	4.50–5.00–6.00	5.50–6.00–7.00

*Rates on rooms without bath on request.

THE COUNCIL ON DENTAL EDUCATION OF THE AMERICAN DENTAL ASSOCIATION*

Aims and Purposes

The aims and purposes adopted by the Council on Dental Education are as follows:

a. To correlate in accord with the evolution of scientific knowledge, clinical experience and social and economic conditions, the procedures of dental education, with the problems involved in meeting oral health needs, and to interpret the relations of dental education to the dental profession and to the public.

b. To organize and administer criteria for accreditation of institutions for the study of dentistry in the United States. This will include consideration of:

1. Predental education and requirements for admission to dental schools.

2. Undergraduate dental education, and requirements for the D.D.S. or D.M.D. degree in dental schools.

3. Graduate and postgraduate education in dentistry, and requirements for the accreditation of specialists in dental practice.

4. Such other educational activities as may come within the Council's jurisdiction.

c. To list recurrently for publication the acceptable agencies of dental education, in a manner to give the dental profession and the public authoritative information.

d. To facilitate effective coordination of the efforts of dental schools, dental state boards and dental societies toward maintenance of adequate standards of professional proficiency.

e. To promote more complete understanding, in universities, in medical schools and by the public, of the current needs of progressive dental education and dental research in the public interest, and to stimulate the continual development of dental education.

f. To inform the dental profession regarding the nature and scope of the current problems of dental education, and of the conditions and procedures for their solution.

g. To foster constant improvement in the methods of teaching in dental schools, and to encourage the establishment of conditions that would attract an increasing number of men of outstanding ability to the career of dental teaching.

h. To study the educational needs of the practitioner and to recommend ways and means by which he may be provided with opportunities for organized study to maintain proficiency.

Statement of Policy and Principles and Preliminary Statement of Criteria

This statement sets forth the policies, principles and criteria under which the Council will operate in accrediting institutions for dental education in the United States. The principles and criteria are defined in general terms and indicate briefly the features which will be studied as a basis for accreditation. This statement will be followed by one which will provide more specific information relative to the principles and criteria here included, and to the procedures which the Council will follow in administering its functions.

ACCREDITATION

The Council will view as acceptable institutions for dental education the character of which is in keeping with the principles and criteria defined in this statement.

PURPOSE OF ACCREDITATION

The purpose of accreditation is:

1. To indicate the character of institutions for dental education.

2. To encourage through accreditation

*Statement of aims, policies, principles and criteria adopted by the Council on Dental Education. The criteria are stated in general terms and indicate briefly the features which will be considered as a basis for accreditation. The Council is developing its criteria in further detail, and also the procedures which it will follow in accrediting dental schools.

procedures improvement of dental education in the United States.

3. To provide the basis for selection of dental schools by prospective students.

4. To provide the basis for interpretation of interinstitutional relationships.

5. To indicate the character of institutions for dental education to dental licensing boards.

BASIS FOR ACCREDITATION

Accreditation by the Council will be considered in terms of institutions for dental education as a whole, with recognition of certain reasonable variations as far as conformity to these policies is concerned. The Council adopts the principle that excellence in certain features of an institution may compensate for inferior characteristics in other features, and that there may be variation as far as conformity to specific policies is concerned.

PUBLICATION

The Council will publish its policies, procedures and information as to its findings. Accredited institutions will be listed in these publications as being approved by the Council.

REVISION OF POLICIES AND PROCEDURES

The Council recognizes that there will exist need for constant study, revision and improvement of its policies and procedures.

PRINCIPLES

As the basis for its criteria, the Council on Dental Education adopts the following principles, which it views as essential to an effective program for the study of dentistry.

AIMS OF DENTAL EDUCATION

Dental education should aim to equip students to begin the practice of dentistry and to continue their self-education. Broadly, this preparation should be directed toward the understanding and application of the sciences and principles on which effective dental service is dependent, and to the development of satisfactory habits and methods of study.

REMOTE AND IMMEDIATE ENDS

Dental education should be concerned not only with existing problems, but also with new problems as they arise, and with the demands created by the accumulation of knowledge and the changes resulting therefrom to the content of dentistry. Development in the student of qualities and interests associated with both immediate and remote ends should be regarded as a significant purpose of dental education. Achievement of this purpose can best be accomplished by procedures which, in addition to preparing for the beginning of dental practice, also demand the use of qualities essential to the later stages of a professional career.

STUDENT RESPONSIBILITY AND FREEDOM

Procedures in education for dentistry should, as far as possible, place much of the responsibility for achievement upon the student. Emphasis should be directed to the development of initiative, independent thinking, resourcefulness and other enduring qualities rather than to the routine completion of class and laboratory assignments. Freedom of the student to conduct himself as an adult and independent learner should take precedence over rules and regulations.

BIOLOGIC ENDS

The content and procedures of dental education should be based on the conception that dental service to be adequate must serve biologic ends. It is therefore essential that students acquire understanding and appreciation of oral and systemic relations in both health and disease; of the biologic significance of restorative and replacement procedures, and of the interdependence of the dentist and physician in meeting health needs. This conception does not reduce the importance of the technical phase of dentistry, for it implies the demand for a higher degree of proficiency in all forms of dental service.

HARMONIOUS PRACTICES AND METHODS

For satisfactory achievement, it is essential that the interests, attitudes and efforts of the student be in harmony with the aims of dental education. Therefore, the requirements of the educational program should, as far as is possible, be free of methods or practices which cause the student to have incorrect aims.

RESEARCH

The relations of research should be regarded as of marked significance not only to the revision and extension of knowledge, but as well to the attitudes and interests of students. Cultivation of appreciation for research is an essential phase of a program of dental education, and the spirit of research should permeate the activities of both teachers and students.

ADEQUATE LIBRARY FACILITIES

Adequate library facilities should be regarded as of primary importance in the program of dental education. The enlarging content of dentistry, the emphasis which should be placed on independent study and the requirements of research have created greater need for the accumulation and proper use of the printed resources of dentistry and its related sciences.

DENTAL EDUCATION—A UNIVERSITY DISCIPLINE

Dental education should be conducted as a university discipline, in harmony with the purposes and methods of higher education. It should not be viewed as an isolated and independent field of education, but rather as one the effectiveness and progress of which depend to a large extent on the community of effort which university affiliation should provide.

RELATION OF CONTENT TO AIMS

The content of the curriculum should be based on the consideration of how its mastery will assist the student in the attainment of well-determined aims and purposes.

FLEXIBILITY OF THE CURRICULUM

Organization of the curriculum should be flexible, being based on appreciation of dentistry as a growing and expanding science. The curriculum should afford opportunities for adjustments to advances in knowledge and for constant investigation and research relative to its value in the educational program.

DISTRIBUTION OF CURRICULUM TIME

The amount of time assigned to the several subjects of the dental course should be determined by their respective contributions to the aims of dental education, to the effectiveness of instruction and to the time required by students for independent study.

CORRELATION OF COURSES

The dental curriculum should be conceived of as a unit and in terms of the interdependence of its related parts. Correlation of the various courses is essential to an effective educational program as well as to satisfactory student achievement.

QUALITIES AND APTITUDES

Success in the study of dentistry or proficiency in dental practice should be regarded as depending on a group of qualities and aptitudes, rather than on any single talent. The traditional view that satisfactory dental service depends primarily on external qualifications such as manual ability and dexterity should be regarded as an unsatisfactory basis for procedures in dental education.

SELECTION

The selection of students for the study of dentistry should be based on estimates of their capacity to utilize effectively the opportunities and guidance which dental schools are expected to provide. Consideration of the qualifications of applicants for admission should include knowledge of their educational history, the quality of their collegiate training, their health and their aptitude for and interest in the study of dentistry.

REQUIREMENTS FOR ADMISSION

Collegiate requirements for admission to the study of dentistry should be considered in terms of general education. Collegiate training should be viewed as a source of proper habits and methods of study, intellectual self-reliance, knowledge of scientific method and other desirable qualities and interests which lend themselves to broad general application in professional and nonprofessional activities. These general outcomes of collegiate training are of greater value in the study of dentistry than is mastery of subject matter as factual material, often considered to be distinctly preparatory in character.

CRITERIA

THE following statement of criteria indi-

cates briefly and in a general way the features of institutions for dental education which will be considered as a basis for accreditation.

UNIVERSITY RELATIONS

The Council adopts the principle that education for dentistry is best conducted under university auspices, and that all institutions for the study of dentistry should be integral divisions of universities. Accreditation will also include consideration of the character of university relationship from both an administrative and an educational point of view.

OBJECTIVES

Statement of the objectives of an institution for the study of dentistry should be published in its annual announcements, bulletins or catalogs. Procedures for accreditation of an institution will include consideration of the nature of its objectives and their relation to its educational practices.

FINANCIAL GAIN

Education for dentistry cannot be satisfactorily conducted when the motive for financial gain is associated with educational procedures. The Council will view as unacceptable an institution for the study of dentistry which is not incorporated and functioning on a nonprofit basis.

FACULTY

An institution for dental education should have a faculty competent in terms of its objectives and organized for effective teaching. In determining the competency of the faculty, the following features will be examined: number and educational qualifications of teachers; teaching load; number of teachers in relation to number of students, and faculty scholarship, research activities and organization.

CURRICULUM

The curriculum of an institution for the study of dentistry should be in keeping with its stated objectives and the educational qualifications of students admitted. Organization of the curriculum is considered to be the responsibility of the various institutions and will be evaluated in terms of the contributions which it makes toward an institution's objectives. Organization of the curriculum should, however, be in keeping with the changing character of the content of dentistry and the need for utilization of new knowledge in prevention and treatment. The curriculum should be balanced in the sense that it does not overemphasize the content at any point, but rather gives proportional representation in terms of the aims of dental education and public dental needs to be various areas of knowledge in prevention, therapeutics and prosthesis. Consideration should be given to the matter of providing adequate time for study by the student and to the competency of the faculty in providing effective instruction in the announced courses. Examination of the curriculum and its organization will include the relation of subject matter to objectives, the time devoted to the curriculum and the time available for study.

INSTRUCTION

It is expected that an institution will direct instruction toward attainment of its objectives and that it will evidence concern for its effectiveness by study of the problems involved. Instruction should be of a type which places reasonable responsibility for achievement with the student and should not be characterized by methods which make it possible for the student to avoid the discipline of self-education.

REQUIREMENTS FOR PROMOTION AND GRADUATION

The primary basis for promotion and graduation should be achievement. Though the Council recognizes the value of quantitative laboratory and clinical requirements in insuring reasonable repetition and experience in a variety of projects, quantitative requirements should not be such as will be destructive to student interest, nor should their completion become the chief aim of the student.

LIBRARY

Each institution for the study of dentistry should have library facilities adequate for the needs of its student body and faculty. Libraries will be considered in terms of their facilities, functioning, administration and an-

nual expenditure. The extent to which the library resources are utilized in the educational program of an institution will be regarded as an index to the effectiveness of instruction and the methods used. Study for the purpose of determining the extent to which library resources are utilized will include consideration of both their voluntary and their compulsory use by the students, and the former will be viewed as having the greater significance.

ENROLLMENT

The number of students enrolled in an institution for the study of dentistry should be in keeping with its physical facilities, faculty and administrative personnel. The Council will view overcrowding in any class or institution as a whole as a factor operating against the attainment of sound objectives in education for dentistry.

PHYSICAL PLANT

The physical plant and equipment should be adequate to meet the requirements implied in the institution's objectives. Examination of the physical plant and equipment will include consideration of building, classrooms, laboratories and clinics and their equipment, and ventilation, heating, lighting, cleanliness and other features which contribute to effective functioning.

HOSPITAL RELATIONS

The Council accepts the principle that an institution for the study of dentistry should have effective working relationships with an approved general hospital. These relations should be such as will afford the student opportunities for viewing conditions not usually common to the clinic of the dental school; for broadening the knowledge of the student in regard to oral and systemic relations, and for supplementing in a general way the instructional facilities of the institution. Examination will consider the type of hospital relation, its educational value and the extent to which it is used by an institution in its educational program.

FINANCES

Consideration will be given to adequacy of an institution's financial resources, their source, the effectiveness with which they are utilized, the expenditure per student by the institution and the financial administration and indebtedness.

REQUIREMENTS FOR ADMISSION

The Council adopts as a minimum basis for admission to an approved dental school two years' credit toward a baccalaureate degree in a college of arts and science accredited by an agency acceptable to the Council. The following minimum quantitative requirements prescribed by the Council are applicable to students admitted to dental schools beginning with the 1941-1942 session:

	Semester Hours
Biology	6
Inorganic chemistry	8
Organic chemistry	4
Physics	6
English	6
Electives	30 or more

Deviation from the Council's prescribed minimum requirements is allowed in all of the required subjects except chemistry and is dependent on the length of college training and the level of achievement attained by students in their college work.

Semester Hours	Deviation
60 semester hours	None
90 semester hours	6 hours
Bachelor of science or bachelor of arts degree	9 hours
Master of science or doctor of philosophy degree	12 hours

The Council recognizes the extreme variability in the significance of college marks and in the quality of colleges of arts and science. Therefore, it is the opinion of the Council that the selection of students for admission to dental schools should be based on estimates of their capacity for success in the study of dentistry as determined by evaluation of all available and significant information. Consideration of the qualifications of applicants for admission should include information regarding their knowledge, their educational history, the quality of their collegiate training, their health and their aptitude for and interest in the study of dentistry.

THE COUNCIL ON DENTAL EDUCATION

From the American Dental Association:
Arthur C. Wherry, Salt Lake City, Utah, Chairman
Walter M. Morgan, Nashville, Tenn.
M. Webster Prince, Detroit, Mich.

From The American Association of Dental Schools:
Leroy M. S. Miner, Harvard University, Vice Chairman
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J. Ben Robinson, University of Maryland

From the National Association of Dental Examiners:
Minor J. Terry, Albany, N. Y., Secretary Pro Tem.
Robert L. Sprau, Louisville, Ky.
William F. Bell, Asheville, N. C.

DENTAL PRACTICE ACTS: SUSPENSION OF LICENSE OR CONVICTION OF CRIME; SUBSEQUENT GOOD CONDUCT AS MITIGATING CIRCUMSTANCES

BROWN, a licensed dentist, was convicted of manslaughter and sentenced to pay a fine and serve a jail sentence. The jury recommended clemency and he was thereafter paroled. About a year and a half later, the board of governors of the registered dentists of Oklahoma suspended Brown's license under a provision of the dental practice act authorizing the board, on presentation of a certified copy of a court record showing that a licentiate has been convicted of a crime involving moral turpitude, to revoke his license or to suspend him from practice or to reprove him. Brown appealed to the Supreme Court of Oklahoma.

The evidence showed that Dr. Brown had practiced dentistry since 1911, that he had always borne a good reputation, that he was a man of good morals and high character, that the only blemish on his record was the act which formed the basis of his conviction, and that subsequent to the conviction he bore a good reputation and maintained a high standing of character. One who has practiced his profession for twenty-three years, said the Supreme Court, maintaining at all times an excellent reputation and being in fact a man of high character, but who then is guilty of such an act of moral turpitude as was here charged against Brown, may thereafter so conduct himself by right conduct in his profession and as a citizen as to reestablish himself as a man of high character. This, in the opinion of the court, Dr. Brown had done. The board seemed to have concluded that the conviction required it to take disciplinary action without regard to the fact that subsequent to the conviction the dentist had conducted himself above reproach. That view, the court said, while doubtless entertained in good faith, was erroneous and in law constituted an abuse of discretion on the part of the board.

The Supreme Court accordingly reversed the decision of the board suspending Brown's license to practice dentistry. —Board of Governors of Registered Dentists of Oklahoma v. Brown (Okla.), 76 P. (2d) 1074. *J.A.M.A.*, 111:1959, November 19, 1938.

LIBRARY BUREAU
of the
AMERICAN DENTAL ASSOCIATION
212 E. Superior St., Chicago, Ill.

Books published in 1936-1939
which may be borrowed* or purchased†

AMERICAN DENTAL ASSN., COUNCIL ON DENTAL THERAPEUTICS: Accepted dental remedies. Chicago: American Dental Assn., 1938. $1.00.

AMERICAN FOUNDATION: American medicine. 2 vols. New York: American Foundation, 1937. $3.50.

AMERICAN MEDICAL ASSN., BUR. OF MED. ECON.: Group hospitalization. Chicago: Amer. Medical Assn., 1937. $.75.

BAILEY, HAMILTON: Clinical surgery for dental practitioners. London: Lewis, 1937. $4.00.

BARNHILL, J. F.: Surgical anatomy of the head and neck. Baltimore: Wm. Wood, 1937. $20.00.

BIRCH, C. L.: Hemophilia—clinical and genetic aspects. Urbana, Ill.: Univ. of Illinois, 1937. $2.00 paper, $2.50 cloth.

BLACK, A. D.: G. V. Black's work on operative dentistry with which his special dental pathology is combined. 4 vols. V. 1—Pathology of hard tissues of teeth; oral diagnosis. V. 2—Technical procedures in making restorations in teeth. V. 3—Treatment of dental caries. V. 4—Diseases and treatment of investing tissues of teeth and other soft tissues of mouth. Chicago: Medico-Dental Publishing Co., 1936. Complete set $16.00, $4.50 per volume.

BLAIR, V. P., & IVY, R. H.: Essentials of oral surgery. St. Louis: Mosby, 1936. $6.50.

BLAYNEY, J. R.: Dental pharmacology and therapeutics. St. Louis: Mosby, 1936. $4.00.

BOYD, J. D.: Nutrition of the infant and child. New York: Nat. Medical Book Co., 1937. $3.00.

BOYLE, H. H.: Principles and practice of applied dental aesthetics. London: Kimpton, 1936. $7.25.

BREGSTEIN, JOSEPH: Dentist and his control of practice. Brooklyn: Dental Items Interest, 1939. $4.00.

BRODERICK, F. W.: Principles of dental medicine: the medical aspects of dental disease. St. Louis: Mosby, 1936. $7.50.

BULLEID, ARTHUR: Bacteriology for dental students. St. Louis: Mosby, 1938. $4.75.

BUNTING, R. W.: Oral hygiene and the treatment of parodontal diseases. Philadelphia: Lea & Febiger, 1936. $2.50.

CARNEGIE, DALE: How to win friends and influence people. New York: Simon & Schuster, 1937. $1.96.

COMROE, B. I.; COLLINS, L. H., & CRANE, M. P.: Internal medicine in dental practice. Philadelphia: Lea & Febiger, 1938. $4.00.

COOK LABORATORIES: Manual of local anesthesia in general dentistry. New York: Cook Laboratories, Inc., 1936.

DARLINGTON, C. G.: Yearbook of dentistry, 1936. Chicago: Year Book Pub. Co., 1937. $3.00.

DARLINGTON, C. G.: Yearbook of dentistry, 1937. Chicago: Year Book Pub. Co., 1937. $3.00.

DARLINGTON, C. G.: Yearbook of dentistry, 1938. Chicago: Year Book Publishing Co., 1938. $3.00.

DAVIS, M. M.: Public medical services: Survey of tax-supported medical care in the United States. Chicago: Univ. of Chicago Press, 1937. $1.50.

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*Books may be borrowed by members of the Association for a period of one week after date of receipt; if they are not reserved for some one else, the period will be extended on request. A deposit of $2.00 for each volume to be sent at one time should accompany all requests for books. This will be refunded on return of books.

†If you wish to purchase books, indicate plainly which books you desire and enclose check with order.

In addition to the books listed above, older books are available from the Library Bureau. A printed list of these books will be sent upon request.

Junior members may borrow material from the Library Bureau under the same regulations as regular members. As the library facilities are limited, dental students other than Junior members cannot be accommodated.

DOUGLAS, P. H.: Social security in the United States. New York: McGraw, 1936. $3.50.

DOXTATER, L. W.: Full and partial denture prosthesis. Brooklyn: Dental Items Interest, 1936. $6.00.

DUNNING, W. B., & DAVENPORT, S. E.: Dictionary of dental science and art. Philadelphia: Blakiston, 1936. $6.50.

ENNIS, L. M.: Dental roentgenology. Philadelphia: Lea & Febiger, 1936. $6.50.

EPHRAIM, J. W.: Take care of yourself: a practical guide to health and beauty. New York: Simon & Schuster, 1937. $2.00.

EPSTEIN, ABRAHAM: Insecurity; a challenge to America. New York: Random House, 1936. $4.00.

ESSIG, N. S.: Prosthetic dentistry. Brooklyn: Dental Items Interest, 1937. $4.00.

FAIRBROTHER, R. W.: Text-book of medical bacteriology. St. Louis: Mosby, 1937. $4.50.

FALK, I. S.: Security against sickness. New York: Doubleday, Doran, 1936. $4.00.

FISH, E. W.: Principles of full denture prosthesis. London: Bale, 1937. $5.00.

FÜLÖP-MILLER, RENÉ: Triumph over pain. New York: Bobbs-Merrill, 1938. $3.50.

FURNAS, C. C., & FURNAS, S. M.: Man, bread and destiny: the story of man's food. New York: Reynal & Hitchcock, 1937. $3.00.

GORDON, S. M.: Dental science and dental art. Philadelphia: Lea & Febiger, 1938. $9.50.

GOTTLIEB, BERNHARD, & ORBAN, BALINT: Biology and pathology of the tooth and its supporting mechanism. New York: Macmillan, 1938. $5.00.

GREENFIELD, A. L.: X-ray technic and interpretation of dental roentgenograms. Brooklyn: Dental Items Interest, 1936. $6.00.

HADEN, R. L.: Dental infection and systemic disease. Philadelphia: Lea & Febiger, 1936. $2.50.

HEWER, EVELYN E.: Textbook of histology for medical students. St. Louis: Mosby, 1938. $4.50.

HILDEBRAND, G. Y.: Studies in dental prosthetics. 2 vols. Stockholm, Sweden: Aktiebolaget Fahlcrantz' Boktryckeri, 1937.

HIRSCHFELD, ISADOR: Toothbrush: its use and abuse. Brooklyn: Dental Items Interest, 1939. $7.50.

HOGEBOOM, F. E.: Practical pedodontia or juvenile operative dentistry and public health dentistry. St. Louis: Mosby, 1938. $6.50.

IVY, R. H., & CURTIS, LAWRENCE: Fractures of the jaws. Philadelphia: Lea & Febiger, 1938. $4.50.

JOHNSON, C. N.: Operative dentistry. New York: Natl. Medical Book Co., 1938. $3.00.

JORDAN, E. O., & BURROWS, WILLIAM: Textbook of general bacteriology. Philadelphia: Saunders, 1938. $6.00.

KLINEFELTER, L. M.: Medical occupations available to boys when they grow up. New York: Dutton, 1938. $2.00.

KRONFELD, RUDOLF: Dental histology and comparative dental anatomy. Philadelphia: Lea & Febiger, 1937. $3.75.

LAMB, RUTH DE F.: American chamber of horrors. New York: Farrar & Rinehart, 1936. $2.50.

LEVINSON, C. A.: Examining dentist in food hazard cases. Boston: Author, 1937. $2.00.

LUFKIN, A. W.: History of dentistry. Philadelphia: Lea & Febiger, 1938. $2.75.

MAINLAND, DONALD: Treatment of clinical and laboratory data. London: Oliver & Boyd, 1938. $3.00.

MANSFIELD, WILLIAM: Materia medica, toxicology and pharmacognosy. St. Louis: Mosby, 1937. $6.75.

MASON, E. G.: Why we do it. Elementary discussion of human conduct and related physiology. St. Louis: Mosby, 1937. $1.50.

MCBRIDE, W. C.: Juvenile dentistry. Philadelphia: Lea & Febiger, 1937. $6.00.

MCCALL, J. O.: Fundamentals of dentistry in medicine and public health. New York: Macmillan, 1939. $2.75.

MCCLENDON, J. F., & PETTIBONE, C. J. V.: Physiological chemistry. St. Louis: Mosby, 1936. $3.50.

MCGEHEE, W. H. O.: Textbook of dental pharmacology, materia dentica and pharmaco-therapeutics. Philadelphia: Blakiston, 1936. $4.25.

MCGEHEE, W. H. O.: Textbook of operative dentistry. Philadelphia: Blakiston, 1936. $10.00.

MILBANK MEMORIAL FUND: Next steps in public health. New York: Milbank Memorial Fund, 1936.

MILLER, S. C.: Oral diagnosis and treatment planning. Philadelphia: Blakiston, 1936. $7.50.

MILLER, S. C.: Textbook of periodontia. Philadelphia: Blakiston, 1938. $8.00.

MILLIS, H. A.: Sickness and insurance: study of the sickness problem and health insurance. Chicago: Univ. of Chicago Press, 1937. $2.00.

MISSOURI STATE DENTAL ASSOCIATION: History of dentistry in Missouri. Fulton, Mo.: Ovid Bell Press, 1938. $6.00.

MITCHINER, P. H.; SHATTOCK, C. E.; SLESINGER, E. G., & WAKELEY, C. P. G.: Surgery for dental students. Baltimore: Wood, 1936. $4.75.

NEVIN, MENDEL, & PUTERBAUGH, P. G.: Conduction, infiltration and general anesthesia in dentistry. Brooklyn: Dental Items of Interest, 1939. $6.00.

NOYES, F. B.; SCHOUR, ISAAC, & NOYES, H. J.: Textbook of dental histology and embryology including laboratory directions. Philadelphia: Lea & Febiger, 1938. $6.50.

PADGETT, E. C.: Surgical diseases of the mouth and jaws. Philadelphia: Saunders, 1938. $10.00.

PEARLMAN, L. M.: Your breath and your health. 295 Madison Avenue, New York: Academy Pub. Co., 1936. $1.00.

PRINZ, HERMANN: Dental formulary. Philadelphia: Lea & Febiger, 1936. $3.50.

PRINZ, HERMANN, & RICKERT, U. G.: Dental materia medica and therapeutics. St. Louis: Mosby, 1938. $6.00.

PRINZ, HERMANN: Diseases of soft structures of the teeth and their treatment. Philadelphia: Lea & Febiger, 1937. $6.50.

RAUGH, A. W.: Analgesia: nitrous oxide in dentistry. Newark, N. J.: Author, 1936. $3.50.

REED, L. S.: Health insurance, the next step in social security. New York: Harper, 1937. $3.00.

RHINEHART, D. A.: Roentgenographic technique. Philadelphia: Lea & Febiger, 1936. $6.50.

RICE, T. B.: Textbook of bacteriology. Philadelphia: Saunders, 1938. $5.00.

SALZMANN, J. A.: Manual for dental technicians. Vulcanite. New York: Pitman Publishing Co., 1939. $4.00.

SALZMANN, J. A.: Principles and practice of public health dentistry. Boston: Stratford, 1937. $4.00.

SCHWARTZ, J. R.: Cavity preparation and abutment construction. Brooklyn: Dental Items Interest, 1936. $6.50.

SHELL, J. S.: Hodgen-Shell dental materials. St. Louis: Mosby, 1938. $4.50.

SHELLING, D. H.: Parathyroids in health and in disease. St. Louis: Mosby, 1936. $5.00.

SIMKINS, C. S.: History of human teeth. Philadelphia: Blakiston, 1937. $4.00.

SKINNER, E. W.: Science of dental materials. Philadelphia: Saunders, 1936. $4.50.

STERN, FRANCES: Applied dietetics. Baltimore: Williams & Wilkins, 1936. $3.50.

STILLMAN, P. R., & MCCALL, J. O.: Textbook of clinical periodontia. New York: Macmillan, 1937. $3.50.

SURE, BARNETT: Little things in life: vitamins, hormones, and other minute essentials for health. New York: Appleton-Century, 1937. $2.50.

SUTTON, D. C.: Physical diagnosis: art and technique of history taking and physical examination of the patient. St. Louis: Mosby, 1937. $5.00.

THOMA, K. H.: Oral diagnosis and treatment planning. Philadelphia: Saunders, 1936. $6.00.

THOMPSON, W. S.: Operative and interpretive radiodontia. Philadelphia: Lea & Febiger, 1936. $7.00.

TURNER, C. E.: Personal hygiene. St. Louis: Mosby, 1937. $2.25.

UNITED STATES PUBLIC HEALTH SERVICE: Dental survey of school children, ages 6-14 years, etc. Public Health Bull. No. 226. Washington, D. C.: Government Printing Office, 1936. 20c.

UNITED STATES PUBLIC HEALTH SERVICE: Survey of dental activities of state departments and institutions of the United States. Public Health Bull. No. 227. Washington, D. C.: Government Printing Office, 1936. 20c.

WALL, S. S.: Manual of dental roentgenology. New York: Guggenheim Dental Clinic, 1936. $2.25.

WELLINGS, A. W.: Practical microscopy of the teeth and associated parts. London: Bale, 1938. $4.00.

WHITE, E. GRACE: Textbook of general biology. St. Louis: Mosby, 1937. $3.00.

WHITEFORD, G. H., & COFFIN, R. G.: Essentials of college chemistry. St. Louis: Mosby, 1937. $4.00.

WIDDOWSON, T. W.: Dental surgery and pathology. London: Bale, 1937. $9.50.

WILLIAMS, H. E.: Scrapbook of dental informalities. Red Bank, N. J.: Author, 1938. $3.00.

WILLMAN, W. P.: Periodontia. New York: Natl. Medical Book Co., 1938. $3.00.

WILSON, NETTA W.: Alfred Owre. Minneapolis.: Univ. of Minnesota Press, 1937. $4.00.

WILTON, AKE: Tissue reactions in bone and dentine. London: Kimpton, 1937. $4.50.

WINTER, LEO: Textbook of exodontia: exodontia, oral surgery and anesthesia. St. Louis: Mosby, 1937. $10.00.

YOUNG, M.; JOHNSON, E.; SMYTH, C., & STILL, M.: Investigations into the nature and characteristic features of post-normal occlusion. London: His Majesty's Stationery Office, 1937. $1.25.

ZAHORSKY, JOHN: Synopsis of pediatrics. St. Louis: Mosby, 1937. $4.00.

ZOETHOUT, W. D.: Textbook of physiology. St. Louis: Mosby, 1938. $4.00.

BUREAU OF PUBLIC RELATIONS

MODERN MOTORIZED DENTISTRY INVADES ANCIENT LANDS AND SANDS*

By E. S. KHALIFAH, D.D.S., M.S.D., Beirut, Lebanon, Syria

THE sands of the Syrian and North Arabian deserts once knew the tread of many empires. The Assyrians, Egyptians, Greeks, Romans and Persians in turn have come and gone. Later, these sands felt the impact of a short-lived Arab Empire. Then, under the influence of the sultans of Constantinople, a general decay set in, progress ceased, irrigation systems fell into disuse and old cities fell into ruins. The remnants of the population of these old civilizations stepped back into the desert and joined the nomad and seminomad tribes. Thus, the desert, the conquest of which governed the rise of ancient empires, gradually advanced and reclaimed the greater part of the Near and Middle East. During this period of decay, other parts of the world were experiencing tremendous development in every line. The coming of the steam boat and train, and then crude oil and the internal combustion engine, knit the world closer together, and most available new land was sought out and developed. All that remained for further development in the world was the huge desert wastes and the desolate areas of decaying or long dead empires. The Near East had all three: desert, sick lands of dead empires and an empire currently dying.

At the beginning of this century, the world, especially the powerful trading nations, were evincing a lively interest in the whole of Asia Minor. Commercial treaties were sought. Railroads were being planned, mineral rights were being bargained for, but little could be accomplished with a crumbling government still attempting to hold an empire together from its uneasy seat in Constantinople.

Then came the World War. These waste lands, which included almost all the battlegrounds of ancient empires, felt again the feet of hundreds of thousands of armed men. Bloody battles were fought as modern man waged the mightiest war these ancient sands had yet known. After the War, which did not end in the East until several years later than the Armistice of 1918, there came a period of reconstruction. The Near East, free of the depressing influence of Constantinople, made every effort to regain her ancient importance. She was given the aid of other strong countries in setting up independent governments and kingdoms.

Great commercial projects were undertaken. Fine highways soon spread like a net connecting the important trade centers. Railroads were built, harbors were enlarged and deepened and new blood in the form of world trade began to flow in. Mineral and oil wealth was sought out and developed with the aid of foreign capital and engineers. The

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largest single development of the latter type was that organized to market the newly discovered oil of Iraq, an undertaking so huge and uncertain that four of the world's largest oil firms pooled their resources to develop it. Large deposits of petroleum were discovered in the foothills of the Kurdish Mountains in Northern Iraq.

To profitably market this oil necessitated the construction of pipelines to the Mediterranean more than 600 miles away. To accomplish this, it was necessary to employ a small army of skilled foreign oil men, supplementing their efforts with the work of thousands of technical men, clerks and laborers from the Near East. This army of men had to be furnished with not only mechanical supplies, but also sanitary and comfortable living quarters, and with a safe water supply as well. Necessarily, the medical department was one of the first to be completely organized, and it was later enlarged to include a dental section.

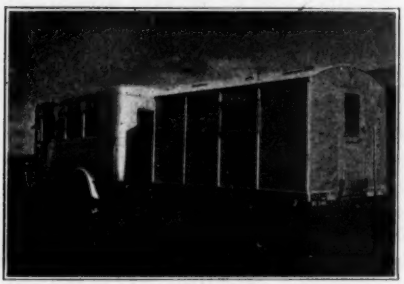

Fig. 1.—Clinic-trailer caravan ready to move.

The American University of Beirut Dental School was conducting a dental survey of the Bedouin tribes of the desert and was familiar with existing conditions. Members of its faculty were approached to assist in organizing a dental section for the company. With thousands of men quartered in ever-shifting camps and located along a line 1,500 miles long, a motorized dental service was indicated. The Amalgamated Dental Company of London was called on for plans for a motorized dental clinic. Various designs were discussed by representatives of the Iraq Petroleum Company, the American University of Beirut Dental School and the Amalgamated Dental Company, and a design was selected.

The Clark Body Works of London and the Hillman Motors of London built the chassis and body. The Amalgamated Dental Company installed the equipment. The completed motorized clinic was delivered to the Near East headquarters in Haifa, Palestine, in September 1933 and started on its first tour of the company lines a few weeks later. As the laboratory space soon proved inadequate, a complete laboratory trailer was designed and built in an Eccles trailer of simple design in the company workshops and joined the clinic at the Euphrates River after its first desert crossing. The clinic was also overhauled and rebuilt according to the experience gained along the 1,500 miles of desert trails.

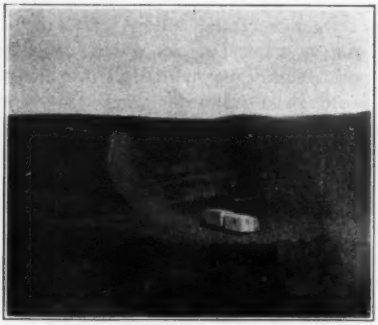

Fig. 2.—On the desert trail.

The dental section of the medical department of the Iraq Petroleum Company is distinctly a health service and not a specialized department of applied dental mechanics. It is organized with an aim to overcome systemic diseases of

dental origin by preventive measures. With the medical department, it does its share in keeping employes on the job doing productive work throughout the year.

The Iraq Petroleum Company is engaged in pumping oil from its source in Iraq to the Mediterranean market of Tripoli and Haifa, 600 miles away. Aside from a large staff in the fields, at the producing ends of the line, and the large staff at each of the marketing terminals at Haifa and Tripoli, there are more than 100 people in each of the twelve stations which occur at 60-mile intervals along the company lines. These lines spread fanwise across the Syrian Desert from Kurdistan to the sea. The distribution of these thousands of employes makes a motorized dental service a necessity.

There are no made roads along the lines, only desert trails. These present almost every obstacle that one can imagine, and any vehicle must be exceptionally sturdy to stand the strain.

The dental clinic, therefore, was built on a strong lorry chassis powered with a heavy motor. The dental laboratory was built in a sturdy two-wheeled trailer and is attached to the clinic for transport. Fully equipped, the clinic weighs 5½ tons and the trailer 2½ tons. The clinic-trailer caravan represents a complete dental office, so well equipped that any case occurring in a modern city practice can be cared for at any point along the 1,200 miles of desert lines.

During the period of construction, when 20,000 men were working in temporary camps, the locations of which depended only on where work was in progress, only emergency dental work could be taken care of. With a light kit, the dental department hastened here and there, doing their utmost to relieve pain and keep the employes at work and dentally comfortable. With the end of construction and the beginning of operation, a permanent staff was chosen and moved to their new desert homes with baggage and families. The employes with their families represent forty nationalities and are living and working in the twelve desert and three city stations. To these employes and their families, the dental department now offers a complete dental service. Two years is required to make a complete tour with the dental caravan. This biennial visit is supplemented by a monthly tour with the portable kit,

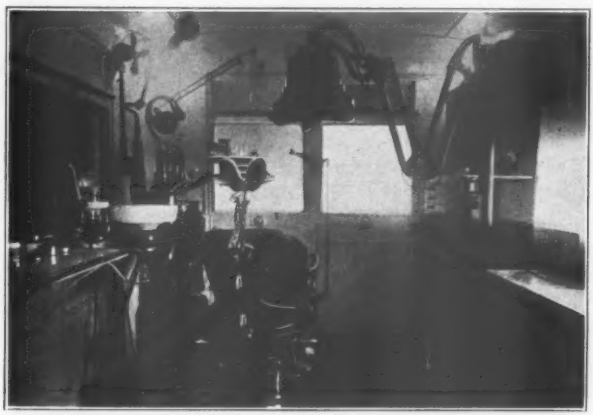

Fig. 3.—Interior of clinic car.

which is folded into three cases and stowed in the rear of a seven-passenger sedan.

The chief dental officer makes the emergency trip one month and the assistant officer the next. This trip varies from two weeks to a month, the dental officer thus keeping in constant touch with new employes and denture adjustments and repairs. In bad weather, the trips are made by plane.

The remaining members of the dental department are the dental mechanic, the dental assistant (who also drives the caravan between stations), the driver of the emergency car and a clerk, who also acts as dental assistant when necessary.

For gold work and dentures of any description, the patient is charged the cost of material plus 15 per cent to cover repairs and loss of gold. All other services are free and a part of the regular health service of the company.

The chief dental officer, a former professor from the American University of Beirut Dental School, has lived and worked in the Near East for many years and is fully aware of all dental problems existing in the five countries through which the pipelines pass. Being a member of the International Committee on Oral Hygiene for the Fédération Dentaire Internationale and having been on a committee that investigated insurance dentistry in the United Kingdom in 1928 and 1929, he organized his department with the best interests of the dental profession (many of them his students) of the Near East in mind, at the same time giving the company a most efficient service.

His formula is that every employe or any member of the employe's family who has been moved away from qualified dental service shall have the service brought to him as efficiently and with

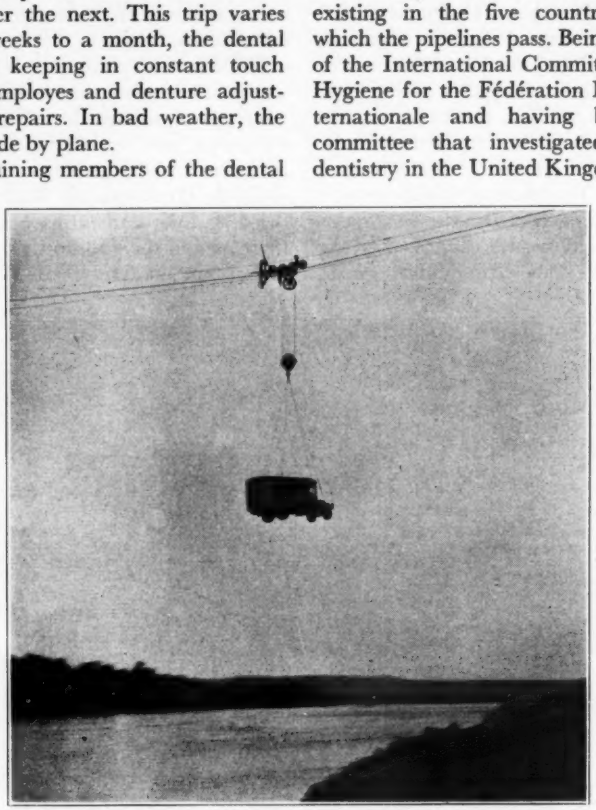

Fig. 4.—Clinic car crossing Euphrates River by cable (no bridges).

as little loss of his or his company's time as possible. In the city stations of the company where qualified dental service exists, the company is not responsible for dental care of its employes, but in the desert stations where no qualified member of the profession could afford to offer a suitable service, the organization offers a service in which every patient can see his dentist monthly.

In every station, there is a fort-like building known as the service unit, in which all the essential services are housed: the arsenal, blacksmith shop, machine shop, carpenter shop, emergency water tanks, artesian well, food stores, cold storage, sanitary stores, wireless sending and receiving sets, doctor's quarters, four-bed hospital and a complete dressing station, not to mention a bomb-proof shelter for the dental caravan during its visit to the stations. There is also a store of tents under which every man, woman and child in the station could find shelter if it was found necessary to set them up in the compound of this amazing structure. It is hoped that roving desert tribes will never go on the warpath against the company and make such measures necessary, but if they do, the company is ready and no detail for such emergency has been overlooked. Besides a regular weekly bus service, and a four-times weekly provision truck service, there is a daily plane service. The company maintains five planes for passengers, light express freight and survey work. Although hundreds of miles apart, all stations are in constant wireless, telegraph and telephone contact.

Fig. 5.—Dentist, dental assistant and emergency kit taking to air.

With such an organization and with a medical officer always on duty in each station, dental as well as other ills can be reported daily. The medical officer keeps a list of all dental complaints, and on the arrival of the dental officer, the patients are collected and brought by turn to the dressing station where the portable kit is set up. Every type of work except fixed gold bridge work and roentgenography is taken care of permanently on these monthly visits with a minimum of the patient's or the company's time involved. On the biennial trip with the large caravan, which is always in progress, complete duplicate roentgenograms are taken of all new employes and retakes of former patients when necessary. One set of roentgenograms is always on file in the clinic car, the other set in the portable kit. The dental assistant drives the clinic car and is responsible for its packing and unpacking as well as its moving from place to place. The clerk is responsible for detailed dental records and the general clerical work of the department.

As operative procedures are standardized, the assistants work well with either dental officer. As the moving of the clinic is definitely the responsibility of the dental assistant, it is not uncommon to change assistants by plane from one end of the 1,200-mile system to the other when the caravan is ready for a move on its regular schedule.

Supplies are obtained from the London office on a semi-annual requisition and stored in the medical stores at headquarters. To avoid extra weight, only a monthly supply is held in the caravan. The daily plane service brings emergency supplies within twenty-four hours at any time.

The chief dental officer's varied interests and contacts throughout the Near and Middle East make him a valuable member of the liaison department of the company. For many years, he has been conducting a dental survey of nomad Bedouins of the North Arabian and Syrian deserts. Most of these wandering tribes cross over or come close to the company lines during their annual migrations. The reports of this survey are eagerly sought by dental publishers. In this work, he is encouraged and assisted by Weston A. Price and the F. D. I. Together with his wife, the chief dental officer works with the Field Museum of Chicago. Working with Mr. Henry Field of that institution, they have accumulated a great amount of anthropological data from the tribesmen. The records of the latest expedition are given in "Field Museum of Natural History Anthropology Memoirs," vol. IV. They are also collectors of birds, the skins of which have been requested by various museums in different parts of the world. The bulk of bird skins, snakes, lizards, insects, etc., are contributed, however, to the Field Museum of Chicago. The chief officer's wife is an expert on bird skinning and collecting, and often lives for weeks with the tribes when moving near the company lines. Dr. and Mrs. Clawson are also keenly interested in archeology and visit annually all the important archeological expeditions in the Near and Middle East. Archeologists have made possible a large collection of ancient teeth and mandibles, each accurately dated and of great interest to all dentists who see them. The chief officer's interest in archeology has also given to dentistry some of the most interesting and accurate descriptions of ancient specimens of dental work existing in the museums of the Near East, some of the appliances described having, because of the interest thus aroused, become the prize exhibit of their respective museums. His interest in dental education has never ceased, although officially he is not at present connected with any school. The three dental schools in the Near East know, however, that they can call on him for any service at any time and he will respond. He has under preparation an illustrated textbook on operative dentistry. The smallest amount of written text that is practical will be printed in the languages of the three schools; i. e.,

Fig. 6.—Mrs. Clawson and Mr. Henry Field helping in Bedouin dental survey.

English, Arabic and French. Under preparation also is a history of American dentistry in the Near East, with a few introductory chapters on the ancient and medieval dental background of the modern profession in the Near East. The chief officer also takes an active part in all dental society activities in the Near East and is a regular contributor to these meetings either by lecture or by practical clinics, which he and his friends like best.

Thus it will be seen that a modern dental invasion of these ancient lands and sands has not been by force, but has been welcomed by the Iraq Petroleum Company, and by the profession in the Near East and their governments, schools and societies and, not the least, their patients.

TWENTIETH ANNIVERSARY OF DENTAL PROGRAM: WASHINGTON COUNTY DENTAL SOCIETY PIONEERS THE DENTAL PHASES OF PREVENTIVE MEDICINE

By LEON R. KRAMER,* D.D.S., Topeka, Kan.

THE eyes of the entire medical world are now being focused on health programs that have promoted the preventive phases of medicine over a period of many years. The government and leaders in medical science are studying the work of societies and of individuals who have pioneered the field in the prevention of pain and disease, with the idea of applying these principles on a national scope.

Washington County, Kansas, owing to the vision of the leaders in the dental profession in Kansas, and the unceasing work of the dentists of this country toward the ideals of preventive dentistry, now enjoys a conspicuous place in public health achievements. To our knowledge, the Washington County dental program is the oldest continuous service of its type in existence.

In 1919, a state law was passed which permitted school boards to finance a dental inspection of school children's teeth. Immediately, the dentists of the county explained to the school boards the great humanitarian service that this statute permits the dental profession to offer, in the prevention of pain and loss of teeth, to the school children of Washington County. They also explained to the school boards that, by finding dental defects at their very beginning, through annual dental inspection, the cost of repair, if carried out immediately, is no greater than the cost of extraction, which will necessarily follow if the disease is not discovered and corrected. The school boards could readily see that saving just one tooth for one child in each class room would more than pay for the dental inspection of the entire room for more than ten years. From that year, 1919, to the present time, dental inspection has been carried on each year in the schools of this county.

The examinations made during the first few years revealed that the average

*Director of the Division of Dental Hygiene, Kansas State Board of Health.

child had three and eight-tenths cavities in his teeth, one of which was abscessed. After the program had reached the tenth year, every dentist began reporting that he found many rural schools in which corrections had been made 100 per cent. Many of the larger schools reported that the examination showed very few, if any, abscessed teeth. Teachers reported that, for the first time in their experience, all their pupils went through the year without being absent because of toothache. Even during the lowest ebb of the depression, the county-wide report of dental inspection showed that the average number of cavities in permanent teeth per child was only one, and in temporary teeth, one. Abscessed teeth and toothache had been reduced to a minimum.

The visit of the dentist to the schools has become a regular part of school work. Washington County children, for twenty years, have been instructed in matters of oral health. The dentists of Washington County have fulfilled their professional duty, that of teaching the truth about dental health to the public they serve. Truly, this is an achievement worthy of the highest praise.

[Note.—The author of this article was chairman of the committee that instituted this program in Washington County, Kansas, twenty years ago. He has done much to direct and perpetuate the program through the ensuing years.]

MAY DAY—CHILD HEALTH DAY

THE 1939 May Day-Child Health Day slogan will be reminiscent of the Children's Year campaign which ended in 1919—twenty years ago, the Children's Bureau of the U. S. Department of Labor recently announced.

"The Health of the Child Is the Power of the Nation" will be the Child Health Day slogan for 1939. First used during the Children's Year campaign, the slogan is particularly appropriate this year, because 1939 will also be a year of national stock-taking in the field of child health and welfare.

This will mark the fourth consecutive year that the Children's Bureau at the request of the state and provincial health authorities of North America has sponsored the annual celebration of May Day as Child Health Day, first suggested by a former chief of the Children's Bureau and carried on for many years by the American Child Health Association, until its dissolution in 1935.

On the very eve of May Day-Child Health Day, President Roosevelt has called the first meeting of the Planning Committee of a White House Conference on Children in a Democracy. This conference will be at work during the remainder of the year and will close early in 1940.

Local communities will stress their own problems in the field of child health May 1, 1939, but special emphasis will be given to problems of nutrition. In preparation for May Day, the Children's Bureau has suggested that local communities survey what they are doing to promote good nutrition of mothers and children.

The U. S. Bureau of the Census has estimated that there were 35,000,000 children under 15 years of age in the United States in 1935, and that the number of persons under 21 totaled around 49,000,000.

The extension of maternal and child-health services in the states has placed the United States in a better position to promote child health, and the recent reductions in maternal and infant mortality show that definite advances can be made.

STANDARD OIL COMPANY OF CALIFORNIA TURNS DENTAL EDUCATOR

Most members of the A. D. A. are aware of Walt Disney's cooperation in allowing the Bureau of Public Relations to employ Mickey Mouse and other fanciful Disney characters to promote dental health for children. This cooperation brought forth new fruit last month in a very helpful manner. The first issue of Standard Oil's *Travel Tykes Weekly,* a 4-page paper illustrated with Disney's inimitable people, carried the dental health lesson below to a million and a quarter children on the West Coast.

Mickey says,

"FOLLOW THE LEADER"

Says Mickey, "Sure, I brush my teeth—
I make 'em shine two times a day!
And toothaches I just never have—
I like my teeth—they're here to stay!"

Now some say "oh" and some kids "ah"
And some kids shout and wail "Oh dear!"
But Mickey's smart—he's *glad* to see
His friend the dentist twice a year!

MUTUAL BROADCASTS CHILD HEALTH

The New Jersey Medical and the New Jersey Dental societies, in cooperation with Rutgers University, are presenting a series of thirteen "Child Health" programs over the Mutual Broadcasting System. Beginning April 6, these programs will be given each Thursday at 1:45 to 2:00 p.m. eastern standard time; 12:45 to 1:00 p.m. central time; 11:45 to 12:00 mountain time, and 10:45 to 11:00 a.m. Pacific time. Tune in and tell your patients to do likewise.

DENTAL ECONOMICS

FAMILY EXPENDITURES FOR MEDICAL AND DENTAL CARE

By MARGARET C. KLEM,* Washington, D. C.

EXPENDITURES for dental care differ from expenditures made for other types of medical care in that they are largely elective and in general can be more easily budgeted. As was pointed out in an earlier study,[1] at least nine-tenths of the population have dental problems, varying from occasional minor local disturbances to serious impairment of general health. Dental care, which has been thought of as a luxury, is a form of medical service which has been neglected by most families, regardless of their income, and seriously neglected by those of low incomes, during times of prosperity as well as in periods of depression. From extensive surveys of dental needs of children, conducted by the U. S. Public Health Service, it was found that nine out of ten school children had decayed teeth or other diseases of the mouth.[2] In a study of dental care in Detroit, Mich.,[3] it was found that, of the entire population surveyed, less than one-half of those 3 years of age or older received any dental care whatsoever during the study year. The service obtained by almost one-third of those who did receive care consisted of extractions only, and only twenty-two persons out of each hundred in the surveyed population (3 years of age or older) received any dental care other than extractions. The effect of income, education and perhaps of pride in personal appearance, especially as it relates to employment possibilities, is indicated in this study by the fact that in households of professional persons, forty-two of each hundred members received care (exclusive of extractions only) during the year; whereas, in the families of unskilled workers, only sixteen of each hundred members received such dental care during the year.

AVERAGE EXPENDITURES FOR MEDICAL CARE

The extent to which families of various incomes regard dental care as essential may be deduced from the amount of money spent for such care, especially if the income is low and other necessities are competing for the expenditure.

Preliminary information on family expenditures recently made available from the study of consumer purchases† indicates how much self-supporting native white families spent in a twelve-month period during 1935-1936 for the several items of medical care, including the services of dentists.

The purpose of this study was to find how American families earn and spend their incomes. Included in the broad picture of outlay for family living were figures on expenditures‡ for fifteen main

*Member of the staff of the Bureau of Home Economics of the Department of Agriculture, on leave of absence from the Social Security Board.

groups of goods and services, which were reported in some detail. The average outlay in each of these main groups increased constantly with income, but in the higher income classes the relative importance of some groups rose, while that of others declined. For many families at the bottom of the economic scale, expenditures for food and housing alone took as much as three-fourths of the annual income. Families in the metropolitan areas with incomes below $1,000 spent more than one-half their income for food. At this income level, village families spent about two-thirds of their income for the essentials of food, housing and clothing, while the families living in small cities spent nearly three-fourths of their income for these items. In general, within the income range between $500 and $4,000, the percentage of total money income expended for medical care amounted to about 5 per cent and showed no tendency to increase or decrease as income rose.

The average amount in dollars spent for medical care, however, increased regularly with income. Among families living in small cities, for example, with incomes of from $500 to $749, the average annual expenditure for medical care is about $36; in the income range from $1,250 to $1,499, the families spend on the average $62, and families with incomes of from $3,000 to $3,999 spend approximately $118 (Table 1). The same increase in average annual expenditures from the low to the high income groups is true in communities of all sizes.

DENTAL EXPENDITURES AS COMPARED WITH TOTAL MEDICAL EXPENDITURES

Families with low incomes spend a much smaller proportion of the total amount expended for medical service for the care of the teeth than is the case among the higher income classes (Table 1). In general, the higher the family income, the larger the proportion spent for dental care.

Out of every $1 expended for medical care, families with incomes from $500 to $749 spend only 4 cents for dental attention in medium-size cities, and from 9 to 13 cents in communities of other sizes. In the income range from $3,000 to $3,999, families in the metro-

†The study of consumer purchases was conducted jointly by the Bureau of Labor Statistics of the U. S. Department of Labor and the Bureau of Home Economics of the U. S. Department of Agriculture, as a Works Progress Administration project. The National Resources Committee and the Central Statistical Board acted as cooperating agencies in formulating plans and providing technical supervision. Data contained in this article have been derived from preliminary tabulations from the study of consumer purchases. Those for metropolitan communities are for New York and Chicago, in which the Bureau of Labor Statistics conducted the investigation. Those for medium-size cities represent communities of from 47,000 to 72,000 population in Pennsylvania, Indiana and Illinois, studied by the Bureau of Labor Statistics. Those for cities of from 9,000 to 19,000 population, villages, and farms, represent selected communities in twenty-two states studied by the Bureau of Home Economics. Data for small cities studied by the Bureau of Labor Statistics are not included in this article. Data for farm counties are based on reports of farm operators, with reports of share croppers omitted. In four states in the southeast, a separate sample of Negro families was also studied. This paper deals only with native white families of selected income groups that received no form of relief during the survey year. Complete reports will be issued by these bureaus on the results of the study in their respective jurisdictions. In combining communities of the same degree of urbanization in different parts of the country to obtain a broader base for averages and percentages, equal weight was given communities in each region.

‡Since this is a study of expenditures, no record is included of dental services that were received at a free clinic or were given free by the family dentist. The use of the term "expenditures," however, does not necessarily indicate that the bills received for certain services were paid during the year. Bills received during the survey year were recorded as expenditures, without regard to the time of their payment.

TABLE 1.—AVERAGE ANNUAL FAMILY EXPENDITURES FOR MEDICAL CARE AND PERCENTAGE OF TOTAL DUE TO SPECIFIED TYPES OF CARE, BY INCOME, IN COMMUNITIES OF SELECTED DEGREE OF URBANIZATION, 1935-1936*

Locality and Income Class	Number of Families Reporting Medical Expenditure	Average Total Expenditures for Medical Care†	Percentage of Total Medical Expenditures Due to Expenditures for Specified Care								
			Total	Physician	Dentist	Oculist and Optician Services and Eye Glasses	Other Specialists	Hospital	Private Nursing	Drugs and Medicines	Other Medical Care
Metropolitan communities											
$ 500 — 749	66	$18.10	100.0	40.3	11.9	0.8	1.1	5.8	—	30.1	10.1
750 — 999	154	32.35	100.0	35.6	24.7	2.2	6.3	7.9	—	15.9	7.4
1,250 — 1,499	380	57.55	100.0	28.1	19.3	4.8	7.8	21.4	0.2	14.8	3.6
2,000 — 2,499	835	99.08	100.0	30.7	21.7	4.7	6.6	15.5	2.2	14.2	4.4
3,000 — 3,999	705	143.33	100.0	23.9	30.6	5.1	10.8	9.5	3.6	12.0	4.5
Medium size cities											
$ 500 — 749	99	$20.90	100.0	52.6	4.3	4.8	2.4	8.1	—	23.5	4.3
750 — 999	133	28.10	100.0	37.4	19.9	8.9	6.4	4.6	—	20.7	2.1
1,250 — 1,499	260	55.30	100.0	36.2	14.1	6.7	8.3	9.2	0.9	19.4	5.2
2,000 — 2,499	421	69.90	100.0	34.0	21.9	8.7	6.9	9.7	1.2	13.7	3.9
3,000 — 3,999	150	109.15	100.0	32.8	24.0	7.2	5.5	5.3	2.9	16.5	5.8
Small cities											
$ 500 — 749	452	$35.82	100.0	35.9	9.4	8.2	13.7	11.3	0.5	18.1	2.9
750 — 999	763	48.87	100.0	36.1	9.7	5.3	8.5	16.1	2.0	18.0	4.3
1,250 — 1,499	906	61.62	100.0	33.7	17.1	6.2	8.3	11.2	1.7	16.4	5.4
2,000 — 2,499	1002	84.72	100.0	27.3	19.4	7.4	10.3	12.1	2.4	16.2	4.9
3,000 — 3,999	474	118.25	100.0	26.2	20.6	6.4	10.5	12.3	6.6	13.4	4.0
Villages											
$ 500 — 749	871	$33.72	100.0	35.2	10.2	5.8	9.0	12.2	1.1	22.4	4.1
750 — 999	1292	36.76	100.0	37.4	12.0	6.3	5.6	14.5	3.2	16.7	4.3
1,250 — 1,499	1242	53.05	100.0	33.0	15.7	6.3	10.2	13.0	2.3	15.4	4.1

2,000 — 2,499	940	77.13	100.0	27.4	18.2	6.9	10.8	14.1	4.4	12.9	5.3
3,000 — 3,999	300	129.52	100.0	24.1	15.3	5.1	13.1	17.4	6.0	12.7	6.3
Farm counties											
$ 500 — 749	1666	$36.48	100.0	38.2	12.7	6.3	10.4	10.4	2.0	16.9	3.1
750 — 999	1887	44.35	100.0	36.2	13.0	6.4	9.0	15.4	1.8	14.7	3.5
1,250 — 1,499	1494	54.05	100.0	34.1	14.7	6.4	10.1	12.7	2.8	15.3	3.9
2,000 — 2,499	1127	77.41	100.0	28.7	17.1	7.0	11.9	15.3	2.8	12.3	4.9
3,000 — 3,999	559	109.78	100.0	28.9	13.2	6.0	10.4	19.3	8.1	10.1	4.0

*Data are derived from preliminary tabulations from the study of consumer purchases. Data for metropolitan communities are for New York and Chicago; those for medium-size cities represent communities of 47,000 to 72,000 population in Pennsylvania, Indiana and Illinois; those for small cities of 9,000 to 19,000 population, villages and farms represent selected communities in twenty-two states. Data for farm counties are based on reports of farm operators with reports of share-croppers omitted. Only reports of native white families of selected income groups that received no form of relief during the survey year are included. In combining communities of the same degree of urbanization in different parts of the country to obtain a broader base for averages and percentages, equal weight was given communities in each region.

†Total expenditures for medical care exclude expenditures for health and accident insurance.

politan areas spend over 30 cents of the medical dollar for dentistry, those in the medium-size cities, 24 cents and those in smaller cities, about 21 cents. Among families living in villages and in the same income range, 15 cents out of each medical dollar was expended for dental care, and among families living in farm communities, 13 cents out of each medical dollar was expended for dental care.

FAMILIES WITH EXPENDITURES FOR DENTAL CARE

In each community group, with one exception, the percentage of families having expenditures for dental care during the survey year range regularly from minimal figures for those with lowest incomes to maximal figures for those with highest (Table 2).

When the proportion of families having expenditures for dental care is related to the degree of urbanization of the communities in which the families are living, it is found that among families with incomes under $750, the proportion having expenditures ranged from 12 per cent for families in medium-size cities to 33 per cent in farm counties. Among families with incomes from $3,000 to $3,999, the range was from 54 per cent in farm counties to 77 per cent in medium-size cities.

AVERAGE EXPENDITURES FOR DENTAL CARE

There are striking differences in the average expenditures for dental care according to the size of the family income. This is true, regardless of the size of community in which the families reside. In metropolitan areas, the average expenditures per family during a year, for all families in the given income group, vary from $2.15 for families with incomes of from $500 to $749 to $43.83 for families having incomes of from $3,000 to $3,999. In small cities, the average dental expenditures of these two income groups are $3.38 and $24.43, respectively.

TABLE 2.—NUMBER AND PERCENTAGE OF FAMILIES IN SELECTED INCOME CLASSES REPORTING EXPENDITURES FOR DENTAL CARE DURING THE SURVEY YEAR, BY INCOME, IN COMMUNITIES OF SELECTED DEGREES OF URBANIZATION, 1935-1936*

Income Class	Families Reporting Expenditures for Dental Care: Number					Per Cent				
	Metropolitan Communities	Medium Size Cities	Small Cities	Villages	Farm Counties	Metropolitan Communities	Medium Size Cities	Small Cities	Villages	Farm Counties
$ 500 — 749	17	12	126	264	555	25.8	12.1	27.9	30.3	33.3
750 — 999	51	46	329	516	764	33.1	34.9	43.1	39.9	40.5
1,250 — 1,499	162	124	493	635	741	42.6	47.7	54.4	51.1	49.6
2,000 — 2,499	506	254	673	597	647	60.6	60.3	67.2	63.5	57.4
3,000 — 3,999	504	115	350	195	300	71.5	76.7	73.8	65.0	53.7

*See star note, Table 1.

TABLE 3.—AVERAGE ANNUAL EXPENDITURES FOR DENTAL CARE BY ALL FAMILIES AND BY FAMILIES RECEIVING THE SERVICE, IN SELECTED INCOME CLASSES, BY INCOME, IN COMMUNITIES OF SELECTED DEGREES OF URBANIZATION, 1935-1936*

Income Class	Average Expenditures by All Families					Average Expenditures by Families Receiving Dental Service				
	Metropolitan Communities	Medium Size Cities	Small Cities	Villages	Farm Counties	Metropolitan Communities	Medium Size Cities	Small Cities	Villages	Farm Counties
$ 500 — 749	$ 2.15	$ 0.90	$ 3.38	$ 3.45	$ 4.62	$ 8.33†	$ 7.44†	$12.11	$11.39	13.87
750 — 999	8.00	5.60	4.73	4.41	5.77	24.17	16.05	10.97	11.05	14.25
1,250 — 1,499	11.10	7.80	10.52	8.35	7.93	26.06	16.35	19.34	16.34	15.99
2,000 — 2,499	21.55	15.30	16.50	14.11	13.25	35.56	25.37	24.55	22.22	23.08
3,000 — 3,999	43.83	26.15	24.43	19.87	14.52	61.30	34.09	33.10	30.57	27.04

*See star note, Table 1.
†Based on reports of less than twenty families.

In farm counties, they are $4.62 and $14.52 (Table 3). The average dental expenditures for all families, except those in the lowest income groups, are in general highest in the metropolitan areas and lowest in the farm counties.

The average expenditure per family for dental care is, of course, considerably higher when limited to the families who received such care than when related to the whole number of families surveyed. When the average is restricted to families with expenditures for dental care, those with incomes of from $500 to $749 have dental expenditures ranging from $7.44 for families in medium-size cities to $13.87 in farm counties. For those with incomes of from $3,000 to $3,999, the average expenditure per family having dental expenditures ranges from $27.04 in farm counties to $61.30 in metropolitan areas.

VARIATIONS IN EXPENDITURES FOR DENTAL CARE

It is obvious that the amount of money which the family has available to spend, its recognition of the need for dental care and the quality and quantity of care purchased are factors in the variation in expenditures for dental care. The use of average expenditures, either the average based on all families studied or the average for the families making such expenditures, conceals the wide variations in the amounts expended for dental care by individual families, even within the same income class.

Information as to the variation in expenditures for dental care is not available for metropolitan families and for families living in medium-size cities. From previous studies, however, it is known that in communities of all sizes, the proportion of the income which went both for total medical expenditures and for dental expenditures varies widely among families in each income group. In general, a large proportion of families have little or no cost, some families have moderate costs and a few incur costs which, with respect to their income, are high. The differences in dental expenditures for families living in small cities, in villages and in farm counties are shown in Table 4.

In communities of each size, the percentage of families having low charges is small in the high income brackets, and the percentage of families with high charges increases with the size of the income. It will be recalled that among small-city, village, and farm families, with incomes of from $500 to $749, from 28 to 33 per cent made expenditures for dental care. Of the families having dental expenditures, from 40 to 46 per cent have expenditures of less than $5. None of these low-income families have dental expenditures of so much as $150, and only 1 per cent or less have expenditures of $100 or more. Only a small percentage (from 5 to 8) of small-city, village, and farm families with dental expenditures have expenditures of $40 or more.

When expenditures made for dental care by the income class from $3,000 to $3,999 are examined, it appears that of the families making such expenditures, less than 9 per cent have expenditures of less than $5, and that from 18 to 30 per cent have expenditures of $40 or more. In this income class, the percentage having expenditures of $100 or more range from 3 to 6 per cent.

EVIDENCE FROM PREVIOUS STUDIES

The information gathered in the consumer purchases study with respect to dental care indicates that the receipt of dental attention is closely correlated with the economic circumstances of the family. Not only do more families in comfortable circumstances receive dental attention, but also they expect more for such care than do families not so favorably situated economically. The reliability of these findings is substantiated by

TABLE 4.—PERCENTAGE DISTRIBUTION OF FAMILIES IN SELECTED INCOME CLASSES HAVING EXPENDITURES FOR DENTAL CARE BY INCOME AND AMOUNT OF ANNUAL EXPENDITURES FOR DENTAL CARE IN COMMUNITIES OF SELECTED DEGREES OF URBANIZATION, 1935-1936*

Locality and Income Class	Number of Families Reporting Dental Expenditures	Percentage of Families Having Specified Amount of Expenditures for Dental Care									
		Total	Under $5	$5–9	$10–19	$20–29	$30–39	$40–59	$60–99	$100–149	$150–249	$250 and Over
Small cities												
$ 500 — 749	126	100.0	45.5	25.1	13.8	6.7	4.2	2.7	1.0	1.0	—	—
750 — 999	329	100.0	37.7	22.6	22.9	9.0	3.8	3.2	0.6	0.2	—	—
1,250 — 1,499	493	100.0	23.6	18.7	28.5	11.8	3.6	6.6	4.4	2.3	0.5	—
2,000 — 2,499	673	100.0	10.0	17.8	29.4	16.9	6.9	10.6	5.7	2.4	1.3	—
3,000 — 3,999	350	100.0	6.0	11.4	25.5	16.8	9.8	14.2	9.9	3.5	1.1	1.2
Villages												
$ 500 — 749	264	100.0	45.5	18.7	19.1	7.5	4.4	3.1	1.2	0.5	—	—
750 — 999	516	100.0	41.4	18.8	21.3	6.9	3.7	4.6	3.0	0.3	—	—
1,250 — 1,499	635	100.0	24.6	22.0	25.8	12.0	5.9	4.3	4.7	0.2	0.3	0.2
2,000 — 2,499	597	100.0	14.9	17.1	29.2	18.6	4.7	6.8	5.5	2.8	0.4	—
3,000 — 3,999	195	100.0	8.0	16.0	24.9	18.7	8.1	14.7	4.5	3.0	1.0	1.1
Farm counties												
$ 500 — 749	555	100.0	39.5	18.9	19.3	8.9	5.9	5.0	2.2	0.3	—	—
750 — 999	764	100.0	32.0	23.4	24.1	8.2	2.2	5.2	4.4	0.3	0.2	—
1,250 — 1,499	741	100.0	28.2	22.0	24.9	11.1	4.6	5.5	2.9	0.6	0.2	—
2,000 — 2,499	647	100.0	13.5	18.0	27.7	16.4	8.0	10.9	3.2	1.4	0.9	—
3,000 — 3,999	300	100.0	8.6	12.9	29.9	18.8	11.5	10.3	5.2	2.1	0.7	—

*See star note, Table 1.

data obtained in an earlier study of the Committee on the Costs of Medical Care[4] in which white families were surveyed for twelve consecutive months during 1928-1931.

Families included in the consumer purchases study were visited after the expiration of the year to which the collected information applied, and, in most instances, relied upon memory for the reports given. Families included in the committee study were visited during the survey year at intervals of about two months, and, in most instances, a record was kept by the families of illnesses that occurred and expenditures made for medical care. It may be that the difference between the technics followed in the two studies resulted in less complete reporting on the part of the families reporting consumer purchases, because expenditures for minor illnesses and casual dental care are not readily recalled.

There are, also, considerable differences in the two studies in the income classes between which comparisons are made. Each income class of the families surveyed by the committee includes a wider range than that in the comparable group in the consumer purchases study. However, bearing these differences in mind, some general comparisons may be made as to the receipt of dental care, the average dental expenditures and the relationship of dental expenditures to total medical expenditures.

RECEIPT OF CARE AS REPORTED IN THE TWO STUDIES

Both studies indicate the extent to which dental care is associated with income. In the committee survey, only 26 per cent of the families with annual incomes of less than $1,200 reported a charge for dental care during the survey year; whereas 90 per cent of the families with annual incomes of $10,000 or over incurred dental charges§ (Table 5). In the intermediate income classes, there is a steady increase in the proportion of families incurring such charges as one proceeds from the lowest to the highest.

It appears that, except for low-income groups living in metropolitan areas or in large-size cities, there is a close similarity between the two studies with respect to the proportion of families reporting receipt of dental services for which they incur charges, in all income groups, without regard to size of community in which the family resides.*

Because of the different technics employed in collecting the data in the two studies, however, the only conclusions that can safely be drawn from these comparisons are (1) that the two studies give reliability to each other because of the similarity in the results obtained with respect to the proportion of families incurring dental charges and (2) that probably about the same, or perhaps a slightly larger, proportion of families incurred charges for dental care in 1935-1936 as contrasted with a year in the period 1928-1931. Between the two time periods under consideration, the income of families tended to shift downward, and consequently the finding that the

§Other studies that have shown the influence of the financial situation of the family upon the receipt of dental care are Rollo H. Britten's study of Detroit families (op. cit.) and "The Economic Aspects of Medical Services," by Paul A. Dodd and E. F. Penrose (p. 96). This study shows that, in 1933, 29 per cent of persons in families with annual incomes of less than $3,000 were reported in need of dental care and receiving it, in contrast with 62 per cent in families with annual incomes of more than $3,000. The range according to family income was from 18.7 per cent in families with annual incomes under $499 to 80.8 per cent in families with annual incomes of $10,000 and over.

*No record of free dental care is included in the consumer purchases study, and committee families receiving only free dental care were excluded from the computations presented in this article.

TABLE 5.—PERCENTAGE OF FAMILIES INCURRING DENTAL CHARGES, PERCENTAGE OF TOTAL MEDICAL CHARGES DUE TO CHARGES FOR DENTAL CARE TO ALL FAMILIES AND TO FAMILIES INCURRING DENTAL CHARGES, ACCORDING TO FAMILY INCOME IN COMMUNITIES OF SELECTED DEGREE OF URBANIZATION*

Income Class	Number of Families	Percentage of Families Incurring Dental Charges†	Percentage of Total Medical Charges Due to Dental Charges	Average Charge per Family for Dental Care: All Families	Average Charge per Family for Dental Care: Families Incurring Charges†
All communities‡					
Under $1,200#	1,336	26.0	8.4	$ 4.15	$15.96
$1,200— 2,000	2,837	41.0	13.5	9.01	21.98
2,000— 3,000	2,235	52.5	17.3	16.39	31.22
3,000— 5,000	1,196	62.6	20.4	28.11	44.90
5,000—10,000	723	75.0	22.1	55.06	73.41
10,000 and over	312	90.2	26.0	130.67	144.87
All incomes‡	8,639	48.8	18.5	19.98	40.94
Cities with 100,000 and more persons					
Under $1,200#	215	34.3	11.7	9.12	26.59
$1,200— 2,000	1,035	46.3	15.4	11.53	24.90
2,000— 3,000	988	56.0	18.5	20.51	36.62
3,000— 5,000	602	68.5	22.3	33.64	49.11
5,000—10,000	391	76.0	23.9	59.61	78.43
10,000 and over	157	88.5	25.9	142.50	161.02
All incomes‡	3,388	58.9	19.1	31.72	53.85
Cities with 5,000 to 100,000 persons					
Under $1,200#	249	24.9	4.7	2.21	8.88
$1,200— 2,000	590	39.5	13.9	9.51	24.08
2,000— 3,000	581	53.5	16.5	14.77	27.61
3,000— 5,000	305	61.3	21.1	27.82	45.38
5,000—10,000	250	77.6	22.1	62.98	81.16
10,000 and over	147	87.7	24.5	112.71	128.52
All incomes‡	2,122	50.9	16.0	21.86	42.95
Towns with less than 5,000 persons and rural areas					
Under $1,200#	872	24.7	8.5	3.74	15.14
$1,200— 2,000	1,212	39.4	12.5	7.90	20.05
2,000— 3,000	666	49.2	16.5	14.07	28.60
3,000— 5,000	289	53.7	15.3	18.79	34.99
5,000—10,000	82	70.8	18.8	40.32	56.95
10,000 and over	8	100.0	29.0	113.25	113.25
All incomes‡	3,129	41.5	13.2	11.71	28.22

*Based on 8,639 white families with known income, surveyed for twelve consecutive months, 1928-1931. (Data from Falk, I. S.; Klem, Margaret C., and Sinai, Nathan: Incidence of Illness and Receipt and Costs of Medical Care Among Representative Families. Chicago: University of Chicago Press, 1933, pp. 151, 157, 287, 288.)

†Unpublished data collected by the Committee on the Costs of Medical Care.

‡When various income or community classes are merged, they are combined in weighted proportions according to the distribution in a standard. (See "Incidence of Illness," p. 28.)

#The average income of all families in the "under $1,200" group is $826; for those in cities of 100,000 and over, the average is $831; in cities of 5,000 to 100,000, $855, and in towns and rural areas, $817.

same, or a slightly larger, percentage of the consumer purchases families incurred dental charges during the 1935-1936 survey year may indicate that families retained their dental habits and were unwilling to forego dental care, even with a lowered annual income.

RECEIPT OF VARIOUS TYPES OF DENTAL SERVICES

A more detailed analysis of the dental material collected in the committee study was recently made by Selwyn D. Collins.[5] His study shows that, in addition to the influence of family income on the receipt of dental services, the occupation of the head of the family and the sex of the recipient also have an influence.

In practically every age group and in every income class, females received more dental care than males. This difference between the sexes is found for each type of dental service received. The extent of the differences among the employed group, according to professional status, is indicated by the fact that there were 488 dental cases per thousand males among the professional group as contrasted with 109 per thousand in the unskilled labor group. There were 560 dental cases per thousand females among the professional group as contrasted with 376 per thousand among town and city housewives, and 202 per thousand among farm housewives.

There were only small differences in the number of extractions among persons in the various income classes, but persons in families with incomes of $5,000 and over received seven times as many fillings as did persons in families with incomes under $1,200, and almost ten times as many crowns and bridges. In families with incomes of $5,000 and over, more than fifteen times as many persons had prophylactic treatments; seventeen times as many had examinations or prophylactic treatment when these were the only services received, and nearly fifty times as many persons had orthodontic services as did persons in families with incomes under $1,200.

COST OF DENTAL CARE REPORTED IN THE TWO STUDIES

In almost every income class, regardless of the size of the community, there is a close similarity with respect to the proportion of each medical dollar expended for dental care by the consumer purchases families and the committee families (Tables 1 and 5). In most instances, the costs of the consumer purchases families for dental care represent a higher proportion of the total, but the differences are slight and tend more to show the similarity between the results of the two studies than to point to a noticeable change in the place of dental costs in the total medical-cost picture.

The average expenditure for all families for dental care as reported in the two studies tends, in general, to be the same (Tables 3 and 5). In some income groups, there is a slight increase in the average reported for 1935-1936 over that reported for the earlier period; in others, there is a decrease.

When comparison is made of the average dental expenditures per family having such expenditures, it is found that the expenditures reported in 1928-1931 by the urban committee families tend to be slightly higher than those reported in 1935-1936 by the urban consumer purchases families. Without regard to income, each of the village and farm groups included in the consumer purchases study had lower average expenditures for dental services when the average is restricted to families incurring such charges than was reported in the committee study of families living in towns of less than 5,000 and rural areas.

Information with respect to distribution of families according to the amount of dental expenditures is not available for consumer purchases families living in

TABLE 6.—PERCENTAGE DISTRIBUTION OF FAMILIES INCURRING CHARGES FOR DENTAL CARE BY FAMILY INCOME AND AMOUNT OF ANNUAL CHARGES INCURRED IN COMMUNITIES OF SELECTED DEGREE OF URBANIZATION*†

Income	Number of Families Incurring Dental Charges	Percentage of Families Incurring Specified Charges for Dental Care										
		Total	Under $5	$5–9	$10–19	$20–29	$30–39	$40–59	$60–99	$100–149	$150–249	$250 and Over
All communities†												
Under $1,200#	351	100.0	40.3	21.8	16.4	7.1	4.8	4.3	3.5	0.5	1.3	—
$1,200 — 2,000	1,190	100.0	30.7	18.2	20.2	9.6	5.9	6.4	5.6	1.9	1.1	0.4
2,000 — 3,000	1,192	100.0	20.3	16.6	21.2	12.1	8.1	6.5	8.5	3.8	2.1	0.8
3,000 — 5,000	754	100.0	13.7	14.3	17.5	12.6	9.2	12.8	9.2	4.7	3.9	2.1
5,000 — 10,000	549	100.0	6.0	7.5	16.7	13.0	7.1	13.9	14.7	6.9	8.6	5.6
10,000 and over	276	100.0	2.5	5.9	4.4	6.2	5.6	8.8	20.6	16.0	13.2	16.8
All incomes†	4,312	100.0	24.3	16.7	18.7	10.4	6.8	7.8	7.6	3.4	2.7	1.6
Cities with 100,000 and more persons												
Under $1,200#	74	100.0	31.1	23.0	10.8	8.1	8.1	6.7	5.4	4.1	2.7	—
$1,200 — 2,000	479	100.0	26.9	17.1	20.2	10.6	6.5	7.6	6.7	1.7	2.1	0.6
2,000 — 3,000	553	100.0	17.7	12.5	19.9	12.3	10.8	8.4	8.7	6.0	2.6	1.1
3,000 — 5,000	412	100.0	9.0	10.7	21.1	13.4	9.0	13.4	10.5	6.3	4.4	2.2
5,000 — 10,000	297	100.0	2.6	7.0	14.5	13.2	8.8	13.8	16.3	8.1	9.7	6.0
10,000 and over	139	100.0	2.9	4.3	4.3	7.9	5.8	7.2	18.7	14.4	16.6	17.9
All incomes†	1,954	100.0	16.6	13.0	18.2	11.6	8.5	9.7	9.7	5.5	4.5	2.7
Cities with 5,000 to 100,000 persons												
Under $1,200#	62	100.0	53.2	19.4	14.5	6.5	4.8	—	1.6	—	—	—
$1,200 — 2,000	233	100.0	27.9	15.9	20.7	9.4	9.4	6.0	6.9	2.1	1.3	0.4
2,000 — 3,000	311	100.0	18.7	17.3	22.8	11.6	9.3	6.8	10.3	1.6	1.3	0.2
3,000 — 5,000	187	100.0	18.2	11.8	18.2	10.2	8.0	13.4	10.7	3.7	3.2	2.6

5,000 — 10,000	194	100.0	6.6	8.8	17.6	10.3	4.6	18.0	13.4	5.2	10.4	7.1
10,000 and over	129	100.0	3.1	5.4	7.8	6.2	9.2	10.1	13.2	13.9	13.9	17.2
All incomes†	1,116	100.0	24.0	14.9	19.2	9.8	8.0	8.1	8.7	2.7	2.7	1.9
					Towns with less than 5,000 persons and rural areas							
Under $1,200#	215	100.0	38.2	22.3	18.1	7.0	4.2	5.1	3.7	—	1.4	—
$1,200 — 2,000	478	100.0	33.0	19.3	20.1	9.2	4.6	6.1	4.8	1.9	0.6	0.4
2,000 — 3,000	328	100.0	23.2	19.5	21.3	12.2	5.2	4.9	7.3	3.4	2.1	0.9
3,000 — 5,000	155	100.0	16.1	23.8	10.4	14.2	11.0	11.0	5.1	3.2	3.9	1.3
5,000 — 10,000	58	100.0	10.4	6.9	18.9	15.5	6.9	12.0	13.7	6.9	5.2	3.6
10,000 and over	8	100.0	—	12.5	—	—	—	12.5	37.5	25.0	—	12.5
All incomes†	1,242	100.0	29.3	19.8	18.8	10.0	5.2	6.4	5.8	2.4	1.5	0.8

*See star and second (†) footnotes, Table 5.
†See third (‡) footnote, Table 5.
#See fourth footnote (#), Table 5.

metropolitan areas or medium-size cities, and a comparison on this point with the earlier study must be limited to small-city, village and farm communities (Tables 4 and 6). Both in small cities and in town and rural areas, it appears that, in almost all income classes, fewer consumer purchases families made expenditures of less than $10 than was true of committee families, and fewer had charges of $40 or more. But, without exception, in each income and community class, a larger proportion of consumer purchases families than committee families had dental charges in the intermediate range; that is, from $10 to $40.

A comparison of the findings of the two studies seems to indicate (1) that at least the same and perhaps a slightly larger proportion of the families under study made expenditures for dental care in 1935-1936 than during a year in the period 1928-1931; (2) that both in 1928-1931 and in 1935-1936, the cost of dental care accounted for approximately the same proportion of the total cost of medical care; (3) that family expenditures for dental care in 1935-1936 were on the average about the same as in 1928-1931, and that the average dental expenditures, when restricted to families making such expenditures, were in general slightly lower in 1935-1936 than in 1928-1931, and (4) that, in general, fewer families were incurring low (under $10) or high (over $40) dental bills and more were incurring dental bills of an intermediate amount, that is of from $10 to $40, in the year 1935-1936 as compared with 1928-1931.

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A STUDY OF DENTAL INCOMES

The April issue of the *Survey of Current Business* contains a feature article summarizing part of the results of a nation-wide survey of the incomes of practicing dentists, conducted by the National Income Section, Division of Economic Research, of the U. S. Department of Commerce in cooperation with the Economics Committee of the American Dental Association. The complete survey will contain additional data including comparisons of average income by type of income, type of practice and education. Cross tabulations of income by years, and employment and pay of professional and nonprofessional employes of independent practitioners, will also be presented.

Free copies of the reprints can be obtained by addressing requests to the National Income Section, Division of Economic Research, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, D. C.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Articulators, and for What?—After fifty years of attempting full denture work, while closely following the writings and clinics of the authorities, we are about convinced that much time and money are being spent to detect all of the faults, sins and errors in mastication that the patient has accumulated in using the remains of his vanishing natural teeth, in order that the dentist may incorporate these same defects in the artificial teeth, and thus condemn the patient to bad habits for the remainder of his days.

We should be less interested in one's past habits and more intent on his future welfare. We should be concerned about making dentures anatomically correct and not about building of dentures which force the patient to continue his attempt to accommodate his mandibular movements to the results of old habits, deformities, disease or surgical operations.

We are familiar with arguments advocating building dentures on the basis of accumulated bad habits of previous years, but experience has persuaded us

that, given a denture with correct centric occlusion, a standard compensating curve for the size of the skull and a completely unlocked cuspation, the patient is soon happy in his freedom.

All this is very simple to determine and can be produced from one measurement, a pair of correct models and a double wax rim bite on a sliding adjustable bite-plate. The one measurement is the outside width of the alae of the nose. From this, one can find the position of the cuspids and the upper first molars and the center of the mandibular movements in the act of mastication; all of which is simple and inexpensive to learn, and it works on most of the anatomic articulators, the more simple the better. —*W. Clyde Davis, D.D.S., Lincoln, Nebr.*

Separating Medium.—An efficient and inexpensive separating medium can be made by adding a few drops of ink to soap solution. The soap solution can be prepared by boiling one teaspoonful of "Gold Dust" soap flakes in a pint of water.—*David Waldman, D.D.S., Brooklyn, N. Y.*

Locking Bite-Rims—To hold the bite-rims together when removing them from the mouth, cut long paper clips into U-shape staples and insert in the upper and lower bite-rims to "lock" them together.—*William F. Taylor, D.D.S., Legion, Texas.*

Removing Bridge Facings—To remove facings before soldering in bridge, crown and plate repair work is not always an easy task. If they are left on the case, they subsequently loosen, one at a time, much to the annoyance of both patient and dentist. If you will subject these facings to from 700 to 1,000 degrees of heat in the electric oven or over a protected gas flame for about fifteen minutes' then cool and put case in a hot bath of hydrochloric acid for from about thirty minutes to one hour, they are readily pushed off. The case should have been previously soaked in a bath of hydrogen peroxide 2 parts and household ammonia 1 part, mixed fresh each time. This removes organic matter and prevents discoloration.—*W. Clyde Davis, Lincoln, Nebr.*

Spruing Wax Inlay Patterns—When spruing direct wax patterns in upper anterior three-quarter restorations, this simple procedure will eliminate the necessity of having to hold a hot sprue with the fingers, which causes unsteadiness of the hand, and sometimes failure of the sprue to attach itself to the wax pattern. A cotton roll is moistened and the water expressed from it and it is bent longitudinally in the form of a hammock. The sprue is heated and placed crosswise of the deepest part of the hammock-shaped cotton roll, with one end protruding beyond the edge of the cotton roll. This is now carried to the mouth and the protruding end of the sprue is allowed to fasten itself to the wax pattern. It is easier to hold the cotton roll while the sprue is being fastened than it is to hold a hot sprue. When the sprue is fastened to the wax pattern, the cotton roll is removed from beneath it. Spruing is now complete, except for the reinforcement of the point of attachment. The wet cotton roll will also aid in rapidly chilling the sprue. The hand can be steadied further by resting the fingers on the lower teeth while the cotton roll is held in place.—*A. Martin Berman, 2 Whitney Ave., Floral Park, N. Y.*

Soldering Investment.—One part of white beach sand mixed with two parts of laboratory plaster can be utilized in the laboratory as a soldering investment. —*David Waldman, D.D.S., Brooklyn, N. Y.*

CURRENT LITERATURE

Distribution of Vitamin D in Body After Administration of Massive Doses

By H. Vollmer

Having shown in a previous report that vitamin D in large doses is superior in effect to small daily doses in the treatment of rickets and tetany, the author states that these massive quantities are retained and stored. Most of the vitamin is stored in the skin, liver and brain, a portion being retained in the kidney. Vitamin D was not found in appreciable amounts in the lungs, spleen or bones.—*Am. J. Dis. Child.*, 57: 343, 1939.

L. H. Garrison.

Caries and Sugar; Crude and Refined Sugars Compared in Respect of Calcium and Phosphorus Content

By M. M. Murray

The incidence of caries has been found to be lower in those communities in which sugar is derived from chewing sugar cane or using crude sugar than in those in which the refined product is used. The author determined the calcium and phosphorus content of each material and found that crude sugar juice contains the greatest amount of each element. However, she believes the amounts of calcium and phosphorus to be too small to afford an explanation of the difference in incidence of caries.—*Brit. D. J.*, 66:144, 1939.

L. H. Garrison.

Chemical and Spectographic Determination of Iron in Tooth Material

By M. M. Murray, G. E. Glock and F. Lowater

The iron content of enamel and dentin of sound permanent teeth and sound deciduous teeth in an area of endemic fluorosis was determined by Hill's dipyridyl method. Enamel had a higher iron content (average 0.0279 per cent) than dentin (average 0.0087 per cent) in the fourteen samples compared. No significant differences could be established between different types of teeth. Subgingival calculus contained an average of 0.0196 per cent iron, while white calculus had 0.0089 per cent. Administration of sodium fluoride was found to decrease the iron content of both the enamel and the dentin of upper incisors of rats. Lower incisors did not show the same change.

B. G. Bibby.

Diet: A Predisposing Factor in the Etiology of Vincent's Infection and Periodontitis

By R. M. Kirkpatrick

Clinical and dietary studies on fourteen Papuan natives and subsequent field observations on about 2,000 natives in New Guinea indicated that a partial deficiency of vitamins A and B was associated with Vincent's infection and suppurative periodontitis. To test these observations experimentally, eighty-one rats, divided into nine groups, were fed a variety of diets. From time to time, these animals were inoculated gingivally with emulsions of fusospirochetal material obtained from patients with acute Vincent's infection. The groups of animals on a combined vitamin A and B_2 deficiency showed infection after every inoculation. It is concluded that a high carbohydrate diet in conjunction with a partial deficiency of vitamins A and B_2 predisposes the gums to Vincent's infection and periodontitis.—*D. J. Australia*, 11:478, 1939.

B. G. Bibby.

How to Improve Dental Conditions in the United States

By C. E. Turner

The writer proposes three means of improving dental conditions: (1) by expansion of present programs of public dental health education through the dental and public health agencies; (2) by more emphasis in the schools on the teaching of oral hygiene

and nutrition, correlated with the necessity of regular dental attention, and (3) by the development of nationally accepted standards of dental health so that comparisons of progress among schools and communities can be made.—*Am. J. Pub. Health.*, 29:326, 1939.

S. B. Finn.

Adrenalin in Dental Art

By G. Wakx

Adrenalin is contraindicated as a local anesthetic in hypertension, diabetes, senescence and cachexia. For these cases, corbasil, 3.4 dioxyephedrine, may be used with impunity. This agent is less toxic than adrenalin, and although its vasoconstrictor action is from forty to eighty times less, results of its use are satisfactory.—*L'Information Dentaire*, 20:1109, 1938.

L. Wager.

Mouth Lesions Associated with Dietary Deficiencies in Monkeys

By N. H. Topping and H. F. Fraser

A study of oral lesions produced in thirty-nine Rhesus monkeys on adequate diets and on diets deficient in various vitamin factors reveals varying manifestations of gingivitis, stomatitis, periodontal disease and noma. The monkeys on adequate natural and synthetic control diets, with but few exceptions, developed no oral lesions. The vitamin A deficient diet was almost equally effective in preventing mouth lesions. On a D deficient diet, gingivitis, necrosis of interdental papillae and necrotic gingivitis developed. A more severe form of gingivitis and necrosis were evidenced in vitamin C deficiency. On a B_2 complex deficient diet, necrotic gingivitis and necrosis of interdental papillae were noted, but even more striking was the ulceration of the buccal mucosa and the development, in a few cases, of a condition similar to noma in human beings. Transmission of organisms from infected lesions to normal monkeys on stock diets resulted in no oral disease. The relationship of deficiency disease to oral disease must be considered in seeking the etiologic factors in mouth lesions.—*Pub. Health Rep.*, 54:416, 1939.

S. B. Finn.

The Treatment of Parodontal Disease

By E. W. Fish

This article states that, in chronic inflammation of the parodontal tissues, the infecting organisms do not invade the underlying tissues. The bone resorption and fibrous tissue breakdown which lead to pocket formation are due to diffusion of toxic material into the tissues from the parodontal pockets. The author stresses the importance of gingival massage and pocket elimination.—*D. Rec.*, 59:117, 1939.

B. J. Frey.

Lack of Synchronism of Bone Growth and Tooth Eruption as an Etiologic Factor of Malocclusion

By L. DeCoster

In 150 cases of malocclusion, a great number of divergencies were noted between the osseous age and the chronological age. In many of the cases, there were disorders which affect the symmetry of the face, such as endocrine disturbances. Facial asymmetry also occurs where pathologic conditions cause a retardation in growth, and in nutritional inadequacy diseases such as rickets and scurvy. An understanding of the etiology of malocclusion is necessary to treatment.—*D. Rec.*, 59:129, 1939.

B. J. Frey.

The Metabolism of Phosphorus in Animals

By O. Chievitz and G. Hevesy

By adding radioactive phosphate to the diet of rats, the metabolism of phosphorus atoms taken in with the diet can be followed in the animal body. Geiger-Müller counters were used in the quantitative analyses. In the feeding experiments, 99 per cent of the active sodium phosphate was fed to the animals and the remainder served as a standard of comparison for their ashed biologic samples. An appreciable part of the phosphorus taken finds its way, not only in growing, but also in adult, rats, into the bones, teeth, muscles and different body organs. In growing animals, the atoms already present at an early stage of the formation of the skeleton become equally distributed in the course of time over different parts of the skeleton and organs. Some of

the phosphorus atoms of the bones leave the skeleton for good, being eliminated through the kidneys or becoming located in other organs. The replacement of individual phosphorus atoms by other phosphorus atoms also takes place in the bone tissue of adult animals, including deposition in the teeth. About one-seventh of the phosphorus found in human feces has entered the intestinal tract in the digestive juices after being in the blood stream or the organs of the body for a shorter or longer time.—*Kgl. Danske Videnskab. Biol. Med.*, 13:24, 1937 *(Chem. Abstr.*, 31:4711, 1937).

MARIAN L. LEFEVRE.

Phosphorus Metabolism in Normal, Rachitic and "Treated" Rats

By M. J. L. DOLS, B. C. P. JANSEN, G. J. SIZOO and J. DEVRIES

A NEUTRALIZED aqueous solution of sodium phosphate (I) containing a radioactive isotope of phosphorus was used as an indicator of phosphorus metabolism. "Treated" rats were rachitic animals which had received a dose of halibut oil. A few hours prior to the oral administration, parts of the body were removed and the radioactivity of the samples determined. A rapid entrance of the radioactive phosphorus into the bones of all the groups was observed. No characteristic mode of action of vitamin D on the absorption or reexcretion into the gut of the administered phosphorus could be demonstrated.—*Nature*, 139:1068, 1937 *(Chem. Abstr.*, 31:6309, 1937).

MARIAN L. LEFEVRE.

Circulation of Phosphorus in the Body Revealed by Application of Radioactive Phosphorus as an Indicator

By L. HAHN, G. HEVESY and E. C. LUNDSGAARD

THE distribution of radioactive phosphorus administered subcutaneously to a rabbit was studied. A phosphorus preparation of relatively low activity was used in order not to disturb the normal processes. Within twenty-seven days, 45 per cent of the phosphorus had been excreted in the urine and 11.5 per cent in the feces. The average time that a phosphorus atom spends in the body was calculated as thirty days. The ratio between active and normal phosphorus was highest in the kidneys, muscles and liver and lowest in the bone, particularly the diaphysis. It appeared that during the twenty-seven-day period, an equipartition of the active phosphorus took place between the muscles and the blood, while about 0.9 per cent of the bone phosphorus was protected against the influx of the active phosphorus. The ratio of the active phosphorus to the normal phosphorus in the urine after twenty-one days indicated that some exchange was still occurring between blood and bone. Since active phosphorus shows the same chemical behavior as normal phosphorus, the results of this experiment indicate the fate of all dietary phosphorus.—*Biochem. J.*, 31:1705, 1937 *(Chem. Abstr.*, 32:1777, 1938).

MARIAN L. LEFEVRE.

Clinical Report of the Use of Avertin and Endotracheal Anesthesia for Jaw Fracture

By W. A. FENNELLY

THE author discusses the type of anesthesia suitable for use in reduction of jaw fractures. The small operating area available when ordinary inhalation anesthetics are used detracts from their usefulness. This disadvantage may be overcome by the use of transnasal endotracheal cyclopropane in which the armamentarium is well removed from the field of operation and only a small nasal catheter is substituted. In a series of more than 100 cases, rectal avertin was found to be most satisfactory. It was found that psychic shock incidental to reduction of fractures was eliminated and that postoperative nausea was absent. Unfortunately, the action of the drug varies greatly and its unpredictable results are always a matter of anxiety and concern.—*Cur. Res. Anes. & Analg.*, 18:117, 1939.

J. VOLKER.

Leukoplakia and Allied Mouth Conditions

By DONALD QUICK

THE rôle of leukoplakia and similar mouth conditions and their possible relationship to oral cancer is discussed. Malocclusion, the presence of neglected cavities, poor fillings, rough metal plates, inferior dentures and complicated partial dentures and the galvanic action of dissimilar metals may result

in a chronic irritation of the mucous membrane. The author urges that tissue specimens from chronically infected gum margins be studied along with bacteriologic smears. One of the first signs of oral malignancy is often a burning or a tingling sensation in a particular area of the mouth. Leukoplakia is considered as a possible precursor of cancer. It may or may not be of syphilitic origin. Epsom salts seemed beneficial in the treatment of some cases. Vigorous therapy directed toward liver function deficiencies sometimes brings about spectacular improvement. Compensation of vitamin deficiencies with B_1 and C_1 and nicotinic acid, plus ventriculin in cases showing achlorhydria, should receive particular attention.—*Canad. M. J.*, 40:234, 1939.

J. VOLKER.

A Study of the Submaxillary Gland Virus of the Guinea-Pig

By F. S. MARKHAM

INCLUSION bodies have been described in the salivary glands of the human infant as well as in those of many of the common mammals. The presence of a filterable virus in association with these bodies has been demonstrated previously only in rodents. Here, spontaneous infection with the salivary gland virus was found in from 70 to 74 per cent of guinea-pigs from local dealers. Inclusion bodies were found chiefly in the submaxillary glands, but in five of 762 animals, they were also present in the epithelium of the convoluted tubules of the kidney. Histologic evidence suggests that the inclusions are composed of elementary bodies similar to those known to occur in certain other virus diseases. They are small round bodies, packed together and embedded in a less refractile matrix. The mode of spread of the infection was not discovered. The relative infectivity of the virus is greater for the fetus than for the guinea-pig postnatally. Experimental transmission of the virus was readily effected in young animals by the subcutaneous, intraperitoneal or intravenous inoculation of infective gland suspensions. The young of nonimmune and of immune mothers appear to be equally susceptible. The quality and duration of active immunity in adults may depend on the presence of active lesions.—*Am. J. Path.*, 14:311, 1938.

VIRGIL D. CHEYNE.

The Effect of Ascorbic Acid Deficiency on Enamel Formation in the Teeth of Guinea-Pigs

By P. E. BOYLE

THE effect on enamel formation of diets deficient in ascorbic acid has received relatively little attention. It is Walback's opinion that a deficiency of ascorbic acid has a primary effect on cells of mesenchymal origin, resulting in failure of production of normal intercellular substance. In this study, where several ground and decalcified sections of the teeth were examined, enamel formation was not primarily affected by ascorbic acid deficiency. Areas of hypoplastic enamel were observed in both complete and partial ascorbic acid deficiency. These are adequately accounted for by the failure of collagen fibers and bone matrix to form in the periodontal tissues. Enamel-dentin ratios of thickness greater than 1 in ascorbic acid deficiency result from continuation of enamel formation at approximately the normal rate while dentin formation is retarded.—*Am. J. Path.*, 14:843, 1938.

V. D. CHEYNE.

The Craniomandibular Musculature of the Orang-Utang, Simia Satyrus

By E. L. BOYER

THE craniomandibular musculature includes the temporal, external and internal pterygoid and masseter muscles. When these were compared with the muscles of man, no striking difference was noted. There are many more muscle fibers in the orang arising from the zygomatic arch. These appear to be continuations of the temporal muscle. Fibers which arise from the anterior border of the masseter sweep forward onto the body of the ramus and are more conspicuous than in man. The external pterygoid in man appears to have two definite, separate heads, but in the orang it has one continuous origin. The functions of these muscles appear to correspond in the two species.—*Am. J. Phys. Anthropol.*, 24:417, 1939.

V. D. CHEYNE.

A Diet and Physique Survey in Assam, Rural Bengal and Calcutta

By H. E. C. WILSON and D. D. MITRA

THE diets of three classes of people were analyzed in India; namely, industrial work-

ers, the rural agricultural class and well-to-do Calcutta families. It was found that the diet of the last group approximates in most respects the European diet. The coolie diet is poor in quality and quantity, cases of angular stomatitis and phrynoderma being observed among them. The caries incidence is greatest among the well-to-do and lowest among the coolies. This high incidence among the wealthy is associated with the consumption of sweets. Malocclusion is found most frequently among the poorer classes. It is likely that the children of the poor groups are below the optimum in physique and health, owing largely to malnutrition rather than to racial factors. Diets could be improved without a great increase in expenditure of money by the addition of leafy vegetables and other inexpensive essentials to the diet.—*Indian J. M. Res.*, **26**: 131, July 1938.

V. D. CHEYNE.

Degenerative Changes in the Axis Cylinders of the Dental Nerves, Due to Diets Deficient in Vitamin A and Carotene

By J. D. KING, W. LEMINSKY and DONALD STEWART

PREVIOUS investigation by Edward Mellanby and others has established that marked degenerative changes occur in the nerve fibers of both the central and the peripheral nervous system of animals that have been kept on a vitamin A deficient diet. Histologic methods have shown alterations concerned mainly with the myelin sheath investing the nerve. The present study is concerned with the effect of A deficiency on the axis cylinder and employed a silver impregnation method of staining and a modified Cajal nitric acid to demonstrate the course and distribution of the nerve fibers. Rats, selected as the experimental animals, were fed a vitamin-A free, high oatmeal diet after weaning. The nerves of the pulp, particularly those of the molars, were markedly affected. The nerves of the periodontal membrane showed somewhat less severe changes. Individual fibers were increased markedly in breadth, their diameters being far greater than any seen in normal pulp tissue. Some showed light areas in the center and gave evidence of vacuole formation, breaking down later to form serrated rough fibers. No change of any kind was noted in the nerves supplying the mucous membrane of the gingivae.—*J. Physiol.*, 93: 206, August 1938.

V. D. CHEYNE.

The Teeth of the Pecos Indians

By C. T. NELSON

THIS is a comprehensive review of the dentition of the Indians of the Pecos pueblo. Material for study was obtained from the Pecos osteologic collection in the Peabody Museum. Observations were made on 136 complete skulls, eight skulls without mandibles and twenty-eight odd mandibles. In all, data on more than 5,500 teeth have been recorded. The report is divided into two complete investigations, separate conclusions accompanying each group. Part 1 deals with the size characteristics of the teeth and Part 2 concerns itself with the morphologic characteristics of the teeth. Comparisons are made in each investigation with similar findings for other ancient and for modern peoples.—*Am. J. Phys. Anthropol.*, **23**:261, 1938.

J. VOLKER.

Anemia and Pyorrhea

By C. BARRIEU

THE oral sepsis common in pyorrheic mouths has long been considered an etiologic factor in gastritis with resultant anemia. The constant deglutition of pus establishes a gastritis and hypochlorhydria, permitting an increase in the bacterial flora of the stomach. The presence of toxins liberated by these organisms, together with amino acids, produces a hemolysin, which results in a constant destruction of red blood cells.

Therapy consisting of eradication of the pyorrheic tissues and symptomatic treatment of the anemia is outlined. Since one condition is so dependent on the other, the author insists on extreme care in the elimination of all oral sepsis prior to systemic therapy.—*L'Information Dentaire*, **21**:205-207, 1939.

FRANK ALLEN.

BIBLIOGRAPHICAL

Biology and Pathology of the Tooth and Its Supporting Mechanism.

By B. Gottlieb and B. Orban. Translated by M. Diamond. Published by the Macmillan Co., 1938; 195 pages, 166 illustrations. Price $5.

This book is a translation by Dr. Diamond of certain parts of the text *Zahnfleischentzundung und Zahnlockerung* by Bernhard Gottlieb and Balint Orban. There are seven major divisions: introduction, biology of the supporting mechanism, accelerated tooth eruption, gingival inflammation, *schmutz* pyorrhea and parodontal pyorrhea, diffuse atrophy of alveolar bone and traumatic occlusion.

The authors have assembled a wealth of excellent histologic material obtained from necropsy and animal experimentation. To this, they have added several clinical cases of illustrative character. The material has been carefully selected to illustrate, from the authors' viewpoint, the "biologic concept" of dental disease and treatment. The clinical application of their interpretations is dogmatic and lacks support in many instances in the evidence presented. This is exemplified in the following statements found under the heading "metal crowns," page 117.

"The practice of extending the margin of any metal restoration underneath the gingiva must prove detrimental. This is especially true of the shell crown. This is the opinion which generally prevails in the profession." These conclusions are apparently derived from a study of material that led to the statement immediately following those quoted: "It is necessary to stress the fact that the gingival margin which covers the enamel is attached to it." There is little evidence in the text that this statement is other than occasionally correct and then it is true only to a varying degree. However, it leads to the next statement: "It is necessary to stress the fact that this attachment between the enamel and gingiva must not be disrupted or disturbed." Although no evidence is presented in the text dealing directly with the consequences of a disregard for this so-called fact, the inference is that restorations extending underneath the gingiva serve as a source of irritation leading to recession, cementum exposure and food retention. This inference follows the statement, "It is well known that restorations placed underneath the gingiva are commonly ill fitting and in that way serve as an additional source of irritation."

The rather elaborate philosophic interpretation by the authors of what appears to be a questionable or, to say the least, a variable assumption has been purposely discussed here. Verbosity may prove stimulating to some readers, but it becomes harmful when it is understood by the reader to be factual evidence rather than philosophic interpretation.

It may also lead the reader to a lack of appreciation of the truly valuable part of the text, that portion which presents a concise and accurate report of observations, and the analyses and interpretation thereof. Gottlieb and Orban are past masters at this phase of their work.

It would seem, however, that the authors have minimized the value of their histopathologic contributions in this book, through an overemphasis of the philosophic interpretation. This text, so well translated by Dr. Diamond, should serve only as an introduction to the original work.

S. S. A.

Special or Dental Anatomy and Physiology and Dental Histology, Human and Comparative

By T. W. Widdowson, L.D.S., R.C.S., (Eng.). In two volumes of 852 pages, with 564 illustrations and 12 plates, with a special chapter on "Histological Technique" by J. Leslie Young, L.D.S., R.C.S (Eng.). Published by John Bale, Sons & Curnow, Ltd. London. Price, Vol. 1, 30/ net; Vol. II, 20/net.

This book is intended as "a textbook for students, and a ready work of reference for

the busy practitioner." Dental anatomy is presented as a phase of biology on a par with cytology, embryology, growth and development, histology, general anatomy and comparative anatomy. The author takes great pains to relate his ideas on anatomy to all those biologic factors of which they are a part. Each chapter is embellished with many references to related ideas, and every controversial subject is impartially presented with due reference to numerous authors. Unfortunately, few detailed bibliographic references have been included. Comparatively little space has been devoted to the detailed anatomic forms of human teeth. The illustrations in this section are made from actual anatomic specimens. The chapter dealing with the histologic technic is not up to the standard of the rest of the book.

Volume II is devoted to comparative dental anatomy. Both volumes are well-organized, easily read and fully illustrated. They give the reader a well-rounded, unbiased view of the subjects presented. There is no attempt to convey the thought that these pages contain all knowledge pertaining to the subjects discussed. The author has constructed a road map that gives one a bird's-eye view of the whole and specific directions to any one part.

This text is recommended to students and practitioners.

Fundamentals of Dentistry in Medicine and Public Health

By JOHN OPPIE MCCALL, D.D.S., F.A.C.D., Director, the Murry and Leonie Guggenheim Dental Clinic, New York City; Consultant in Dentistry, The New York Hospital, New York City.
With a foreword by WILSON G. SMILIE, M.D., Professor of Public Health and Preventive Medicine. New York: The Macmillan Co., 1938. Price $2.75.

The realization on the part of medicine of the far-reaching influence that dental infections may have on the general health furnishes the motive for the author to present, in compact form, basic information about teeth that the physician, nurse and public health worker may seek.

Dr. McCall's association with practically every phase of dental health service being offered to the public fully qualifies him to supply this basic information in the manner most intelligible to all health workers, and he has here presented what he considers to be the information desirable and in a manner readily understandable by the lay health worker.

A statement in the foreword by Dr. Smilie, teacher of public health in a medical school, to the effect that in the medical curriculum "not one bit of consideration is given to the structure, function, and disorders of the teeth," affords ample justification and motive for the effort of the present author to assemble in readily receivable form information about the teeth and mouth.

It is not desirable to incorporate all of dentistry in the medical curriculum any more than it is desirable to incorporate all of medicine in the dental curriculum, but the comparatively recent and significant broadening of the scope of dentistry by virtue of the influence of mouth infections upon the system makes it necessary for the medical man to know more about dentistry, the dental man to know more about medicine and the public health worker to know as much as he can about both. The author has here assembled such elemental knowledge of dentistry, and his judgment in the selection and extent of the knowledge presented, as well as the attractive manner of presentation, is good.

The book is well illustrated and well printed on good paper, with large readable type, which makes reading a pleasure. Everyone interested in the intimate relation of dental disease to body disease should read this book of 161 pages.

Surgical Pathology of the Diseases of the Mouth and Jaws.

By ARTHUR E. HERTZLER, M.D., Surgeon to the Agnes Hertzler Memorial Hospital, Holstead, Kansas; Professor of Surgery, University of Kansas. Cloth. 248 pages with 206 illustrations. Philadelphia: J. B. Lippincott Co., 1938.

This profusely illustrated monograph on the surgical pathology of the mouth and jaws should be of interest to dentists and oral surgeons as well as pathologists and general surgeons. The text is brief, but well

written, and the conditions described are adequately covered. Certain of the author's remarks, however, are at variance with the experience of dentists. For example, in a discussion of inflammations of the mouth, Hertzler makes the statement that Vincent's infection may be diagnosed by the discovery of the spirillum; that it cannot be diagnosed on the basis of clinical observation. Many observers uniformly find the spirillum in practically all mouths whether clinical evidence of infection exists or not. The diagnosis is therefore best made on the bases of the clinical picture. The text is not a complete account of all mouth disease, as Hertzler has chosen to describe only certain things that he has seen. The parts on cancer of the mouth and jaws are particularly well presented. This volume can be recommended to those interested in the pathology of the commoner diseases of the mouth and jaws.

The Surgery of Oral and Facial Diseases and Malformations

By GEORGE VAN INGEN BROWN, D.D.S., M.D., C.M., F.A.C.S., Emeritus Professor of Plastic Surgery, University of Wisconsin; Etc. Fourth Edition. Cloth. 778 pages with 1,019 illustrations and twelve colored plates. Philadelphia: Lea and Febiger, 1938. Price $19.00.

The fourth edition of this well known work continues to extend to the oral surgeon the benefit of the author's extensive experience in treating the diseases and malformations of the face and jaws. This, in general, is very adequately done, and the text is well illustrated with photographs and diagrams. The author continues to recommend for the treatment of certain cases of malocclusion median surgical separation of the maxillae at the midline. The value of this procedure is, apparently, to widen the nares and internal nasal passages as well as spread the upper arch.

In the section on skin grafting, Brown makes the statement that homoplastic grafts may be successfully used provided the recipient and donor are of the same blood group. This is not in accord with the opinions of many other surgeons, who find it impossible to use homologous grafts successfully.

This volume will be found valuable to surgeons and oral surgeons as the record of one with a vast experience in this field.

The 1938 Year Book of Dentistry

Edited by CHARLES G. DARLINGTON, GEORGE W. WILSON, HOWARD C. MILLER, WALTER H. WRIGHT and GEORGE M. ANDERSON. Cloth. 807 pages with 567 illustrations. Chicago: The Year Book Publishers, 1938. Price $3.

This handy volume containing abstracts from the medical and dental literature of 1937 and 1938 furnishes one of the best means of keeping abreast with recent advances in the field of dentistry. The book is divided into five sections: diseases of the mouth, pathology and research, operative dentistry, oral surgery, and prosthetic dentistry and orthodontia. Many of the abstracts are followed by pertinent editorial comments and are profusely illustrated. The judgment of the editors in the selection of the material abstracted and the intelligent and concise manner of presentation, as well as the interpolated comments on the various articles, make the Year Book a most valuable addition to the literature of dentistry. The book serves well its purpose of presenting in condensed form the essence of the literature of dentistry for 1938.

Conduction, Infiltration and General Anesthesia in Dentistry

By MENDEL LEVIN, D.D.S., and P. G. PUTERBAUGH, M.D., D.D.S., F.A.C.D. Fourth Edition. Cloth. 412 pages with 213 illustrations. Brooklyn: Dental Items of Interest Publishing Co., Inc., 1938. Price $6.00.

This is an excellent text covering all phases of local and general anesthesia, adequately described and illustrated with photographs of anatomic dissections. The authors discuss both the common and the unusual routes of obtaining local anesthesia and give a short summary of the pharmacologic properties of local anesthetic agents and vasoconstrictors, and a brief but complete summary of the factors in general anesthesia and analgesia. Recent advances and improvements in the methods of obtaining anesthesia and analgesia by the use of monocaine hydrochloride and cobefrin are briefly discussed, with references to current literature. This volume is recommended to those who wish to improve their anesthetic technic, as well as to students looking for a suitable textbook in this field.

INCIDENTS OF PRACTICE

Neuralgia Due to Lower Left Third Molar

By HORACE S. BEEMER, D.D.S., Mason City, Iowa.

A MAN, aged 28, complained of neuralgia. Figure 1 shows lower left third molar in position. Figure 2 is post-operative film of the lower left third molar region. Figure 3 is a roentgenogram of the extracted lower left third molar. The patient reports complete recovery.

302 Foresters Building.

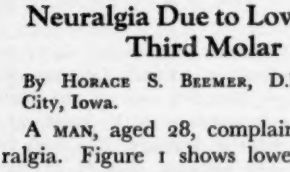

Fig. 1.

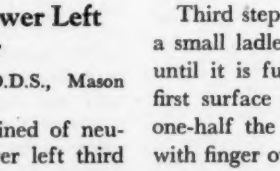

Fig. 2.

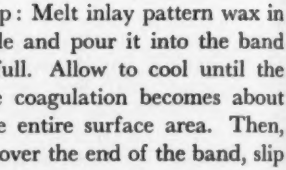

Fig. 3.

Melted Wax Inlay Patterns

By W. F. CORBETT, D.D.S., Houghton, Mich.

FOR three-quarter crown inlays, or any large restoration that is difficult with the ordinary method, a simplified manner of making wax patterns is as follows:

First step: Take a 36-gage aluminum seamless band large enough to go over the tooth, allowing a space of about 0.5 mm. between the tooth and the gum tissue at the cervical border.

Second step: Soften base-plate wax and press the band into it, leaving the cutout circle in the end of the band to act as a retainer for the melted inlay wax.

Third step: Melt inlay pattern wax in a small ladle and pour it into the band until it is full. Allow to cool until the first surface coagulation becomes about one-half the entire surface area. Then, with finger over the end of the band, slip it over the tooth and force the melted wax into the cavity until the wax is squeezed out at the cervical border. (I use a large ball burnishing instrument for the final pressure.) Cool and remove.

Fourth step: Take a small No. ½ or No. 1 bur and split the band down on a side where there will be no interference in any way with the margins, and carefully peel it away. We now have all in one mass a perfect pattern of the cavity that will retain its shape with no distortion.

Place the pattern in the cavity of the tooth and trim the surplus occlusal wax away with a sharp instrument until it is down to an approximate occlusion. Now, with a hot burnisher, soften the occlusal portion and have the patient close very lightly on the wax to indicate the amount of trimming needed to finish the case.

This method is simple, accurate and a great time saver, as it is efficient in the most difficult cases.

Multiple Extractions in Cleft Palate, One Through the Left Nares

By M. H. Thornburgh, D.D.S., West Plains, Mo.

November 18, 1938, a boy, white, aged 13, presented himself for examination and treatment suggestions.

Examination.—Examination revealed a cleft-lip repair on the left side with a heavy scar, and an almost complete cleft of the palate extending through the uvula, soft palate and hard palate, almost to the ridge. At that point, in the left lateral region, there was a small amount of union. The erupted teeth were well formed, but badly malposed and irregular, affording very little occlusion. The upper left central incisor, lateral incisor and cuspid were missing, but a small conical-shaped bud was erupting in that space. The upper right central and lateral incisors were crowded mesially. The cuspid was erupting labially and the first bicuspid erupting lingually into the hard palate. The entire arch was small and decidedly tapering. Roentgenograms revealed three malformed teeth within this union area, and the cuspid normal but unerupted. (Figs. 1 and 2.)

Fig. 1.

Fig .2.

History.—The cleft-lip was repaired at the age of 5 months, but nothing was done about the cleft-palate, with the resultant poor union. Because almost all of the nasal passages were exposed, there was constant irritation from food, making the boy highly susceptible to colds. His progress in school was being retarded chiefly because of a growing sensitiveness to his condition and an inability to speak clearly and some resultant lack of attention on his part. His health was good except for a slight nervousness. Body growth and weight were almost normal.

Operation.—Three days after examination, an incision was made under local anesthesia in the labial median line from the mucobuccal fold to the crest of the ridge, and thence posteriorly almost to the first bicuspid, laying back the flap. Two of the buds were located and extracted, and since the cuspid was left with little support, it too was removed. Further exploration did not reveal the third bud, in spite of the fact that roentgenograms clearly showed it; but further removal of bone structure was deemed inadvisable because of the danger of fracture. Since the patient became quite nervous, the flap was sutured and the upper right bicuspid extracted, and instructions were given to return in two days. On his return, he complained of a "lump" in the left nasal passage. Closer examination revealed the elusive bud emerging into the passage just posteriorly to the nares. Again under local anesthesia, and with the aid of a nasal speculum, elevators and small-nosed forceps, the tooth was removed.

Results.—Healing was uneventful, and shortly thereafter a vulcanite obturator was constructed and inserted. Half-round wire clasps were used on the molars, and the vulcanite was extended

well up into the cleft and posteriorly almost to the uvula. This enables the patient to speak more clearly, and thus to gain more confidence in himself. After three months, a general improvement is reported, both mentally and physically.

A Puzzling Apical Condition

By H. Clay Hassell, Tuscaloosa, Ala.

The accompanying roentgenograms of a lower right first molar, one made in June 1937 and the other in March 1939, show a condition in which diagnosis was baffling.

Fig. 1.—June 1937.

Fig. 2.—March 1939.

The tooth had a treatment filling, composition unknown, which had been placed by another dentist at the time of the first visit. This was left in place until December 1937, when it was replaced with eugenol and zinc oxide paste, in the upper part of which were incorporated alloy fillings to increase the wearing qualities. This treatment filling had lasted well, but was showing considerable wear at the time the second roentgenogram was made. A condition which simulates apical abscess is indicated under the mesial root. However, since this area is relatively lighter than the surrounding osseous tissue, I am at a loss to make a positive interpretation of the roentgenographic finding.

There is some indication of this condition in the original roentgenogram, but it is more definitely outlined in the recent one. (Figs. 1 and 2.) No recent tests have been made for vitality of the pulp.

I shall be grateful for any suggestions or any reference that may lead to authentic information on the condition disclosed.

616 Twenty-Second Avenue.

Exodontia

By John V. Hackett, D.D.S., Chicago, Ill.

Having had thirty years' experience in extracting teeth, the past fourteen years in a practice limited to oral surgery, most of the operating done under general anesthesia, I feel qualified to pass judgment as to how certain oral pathologic conditions should be treated and when and how operations should be performed.

The "ulcerated abscessed tooth" is one painful, really distressing condition in which the dentist wishes to do the utmost for a cure.

Dentists know that this condition often prohibits injections for anesthetizing abscessed areas and that postoperative complications may occur.

The age-old theory that removal of the cause is a means to a cure is incontrovertible. In many abscessed conditions, after proper diagnosis, a general anesthetic should be given, and the teeth be removed and drainage established. This will expedite and insure ultimate cure. It is the surest way to abate pain and often almost immediately relieves suffering.

4 North Cicero Avenue.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ACADEMY OF PERIODONTOLOGY, Milwaukee, Wis., July 13-15.

AMERICAN ACADEMY OF RESTORATIVE DENTISTRY, Milwaukee, Wis., July 15-16.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS, Milwaukee, Wis., July 16-18.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Milwaukee, Wis., July 17-21.

AMERICAN DENTAL ASSOCIATION, Milwaukee, Wis., July 17-21.

AMERICAN DENTAL SOCIETY OF EUROPE, Lausanne, Switzerland, August 7-9.

AMERICAN FULL DENTURE SOCIETY, Milwaukee, Wis., July 15-16.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS, Milwaukee, Wis., July 14-15.

AMERICAN SOCIETY FOR PROMOTION OF DENTISTRY FOR CHILDREN, Milwaukee, Wis., July 17.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York City, fourth Monday in March and October.

ASSOCIATION OF AMERICAN WOMEN DENTISTS, Milwaukee, Wis., July 17-21.

CONGRESS OF AUSTRALIAN DENTAL ASSOCIATION, Melbourne, August 21-26.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June, at the United States Public Health Service Auditorium, Washington.

FÉDÉRATION DENTAIRE INTERNATIONALE, Zurich, Switzerland, July 25-30.

INTERNATIONAL COLLEGE OF DENTISTS, U.S.A. SECTION, Milwaukee, Wis., July 16.

MONTREAL DENTAL CLUB ANNUAL FALL CLINIC, Montreal, Canada, September 27-29.

NATIONAL BOARD OF DENTAL EXAMINERS, May 1-2.

NATIONAL DENTAL ASSOCIATION, New York City, August 14-18.

ONTARIO DENTAL ASSOCIATION, Toronto, June 5-7.

STATE SOCIETIES

May

Connecticut, at Bridgeport (3-5)
Georgia, at Augusta (15-17)
Illinois, at Peoria (8-11)
Indiana, at Indianapolis (15-17)
Iowa, at Des Moines (2-4)
Maryland, at Baltimore (1-2)
Montana, at Livingston (4-6)
Nebraska, at Omaha (15-17)
New York, at New York City (9-12)
North Carolina, at Raleigh (1-3)
North Dakota, at Grand Forks
Pennsylvania, at York (2-4)
South Carolina, at Charleston (8-9)
South Dakota, at Aberdeen (22-23)
Tennessee, at Nashville (8-11)
Utah, at Ogden (25-27)
Vermont, at Burlington (17-18)
West Virginia, at Huntington (15-17)

June

Colorado, at Colorado Springs (22-24)
Idaho, at Sun Valley (19-21)
Maine, at Bangor (25-27)
Mississippi, at Gulfport (12-14)
Nevada, at Reno (3)
New Hampshire, at North Conway (4-6)
Washington, at Wenatchee (11-14)

September

California State, at San Francisco

October

Southern California, at Los Angeles (15-20)
Hawaii, at Wailuku

November

Ohio, at Columbus
Puerto Rico, at Caguas City

February (1940)

Minnesota, at St. Paul (27-29)

April (1940)

Louisiana, at Monroe (18-20)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 19. James A. Blue, 1016 Comer Bldg., Birmingham, Secretary.

Arkansas, at Little Rock, June 19-22. Clarence W. Koch, 817 Donaghey Bldg., Little Rock, Secretary.

California, at San Francisco, May 22; Los Angeles, June 19. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, June 20-24. Almond J. Cutting, Southington, Recorder.

Delaware, July 12-14. Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

Florida, at Jacksonville, June 26-30. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Illinois, in Chicago, June 20-23; November 7-10. Homer J. Bird, Springfield, Superintendent of Registration.

Indiana, at Indianapolis, June 6. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Iowa City, May 29-June 2. Hardy F. Pool, Mason City, Secretary.

Maine, at Augusta, June 28-30. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Minnesota, at Minneapolis, June 23-29. Paul Hagen, Crookston, Secretary.

Mississippi, at Jackson, June 20. A. B. Kelly, Yazoo City, Secretary.

Montana, at Helena, July 10-13. Leonard A. Jenkin, 401 Ford Bldg., Great Falls, Secretary.

Nebraska, at Lincoln and Omaha, June 12-17. Mrs. Clark Perkins, Lincoln, Director.

New Jersey, June 26-July 1. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

New Mexico, at Albuquerque, June 19-22. J. J. Clarke, Artesia, Secretary.

North Carolina, at Raleigh, June 26. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

Ohio, at Columbus, June 26. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 28-July 1. W. T. Longwell, Frederick, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 20-24. W. A. McCready, 1115 Highland Bldg., Pittsburgh, Secretary.

South Carolina, at Columbia, June 8-10. T. C. Sparks, 1508 Washington St., Columbia, Secretary.

South Dakota, at Sioux Falls, June 26-29. C. H. Boyden, Mitchell, Secretary.

Texas, at Dallas, June 12-16. B. Carl Holder, 1009 Nixon Bldg., Corpus Christi, Secretary.

Vermont, at Montpelier, June 26-28. H. B. Small, 82 Church St., Burlington, Secretary.

Wisconsin, at Milwaukee, June 12-16. S. F. Donovan, Tomah, Secretary.

LOUISIANA STATE DENTAL SOCIETY

THE sixtieth annual meeting of the Louisiana State Dental Society will be held in Monroe, April 18-20, 1940.

JULIAN S. BERNHARD, *Secretary,*
417 Medical Arts Bldg.,
Shreveport.

MINNESOTA STATE DENTAL ASSOCIATION

THE next annual meeting of the Minnesota State Dental Association will be held at the St. Paul Auditorium, St. Paul, February 27-29, 1940.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE Seventy-First Annual Meeting of the Dental Society of the State of New York will be held May 9-12 at the Hotel Pennsylvania, New York City.

GEORGE C. DOUGLASS, *Chairman,*
Publicity Committee,
80 Hanson Place,
Brooklyn.

UTAH STATE DENTAL ASSOCIATION

THE Utah State Dental Association will meet at the Hotel Ben Lomond, Ogden, May 25-27.

K. W. MERRILL, *Secretary,*
Provo.

BOARD OF DENTAL EXAMINERS OF ALABAMA

THE Board of Dental Examiners of Alabama will conduct its next annual dental ex-

aminations in Birmingham, June 19. All credentials must be in the office of the secretary at least two weeks before the date of the examinations. Address all communications to

JAMES A. BLUE, *Secretary,*
1016 Comer Bldg.,
Birmingham.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 20-24 for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meetings. For application blanks and further information, apply to

ALMOND J. CUTTING, *Recorder,*
Southington.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Maine State Board of Dental Examiners will be held June 28-30 at the State House, Augusta. Applications, with necessary fee, must be in the hands of the secretary at least ten days prior to the date of examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

MISSISSIPPI STATE BOARD OF DENTAL EXAMINERS

THE Mississippi State Board of Dental Examiners will meet in the State Capitol Bldg., Jackson, June 20, for the purpose of examining applicants for license to practice dentistry and dental hygiene in the state. Examinations will be both theoretical and practical. Applications, together with fee for examinations, must be in the hands of the secretary on or before June 3. Application blanks may be obtained by writing to the secretary. Fee for dental examination, $25; for dental hygiene examination, $15; reciprocity, $50.

A. B. KELLY, *Secretary,*
Yazoo City.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE next meeting of the New Mexico Board of Dental Examiners will be held June 19-22 in Albuquerque. Further information can be obtained by addressing

J. J. CLARKE, *Secretary,*
Artesia.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next annual meeting of the North Carolina State Board of Dental Examiners will be held at the State Capitol, Raleigh, beginning June 26. Applications must be filed with the secretary thirty days before the examination. For application blanks and further information address

WILBERT JACKSON, *Secretary,*
Rich Building,
Clinton.

SOUTH DAKOTA BOARD OF DENTAL EXAMINERS

THE next examination of the South Dakota State Board of Dental Examiners will be held at the Carpenter Hotel, Sioux Falls, June 26-29. Applications should be in the hands of the secretary ten days before the board meeting. For further information, apply to

C. H. BOYDEN, *Secretary,*
Mitchell.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet June 26-28 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, accompanied by the examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. Address all communications to

H. B. SMALL, *Secretary,*
82 Church St.,
Burlington.

ASSOCIATION OF AMERICAN WOMEN DENTISTS

THE Association of American Women Dentists will meet in Milwaukee, July 17-21.

HELEN HAYES HARMAN, *Chairman,*
Publicity Committee,
26 Sheldon Ave.,
Grand Rapids, Mich.

AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTS

THE second annual meeting of the American Association of Public Health Dentists will be held in the Wisconsin Hotel, Milwaukee, Wis., July 16-18.

F. C. CADY, *Secretary,*
U. S. Public Health Service,
Washington, D. C.

INTERNATIONAL COLLEGE OF DENTISTS, U. S. A. SECTION

THE midyear meeting of the International College of Dentists, U. S. A. Section, will be held in Milwaukee, Wis., at the Hotel Schroeder, July 16.

ELMER S. BEST, *Registrar,*
808 Medical Arts Bldg.

EASTERN ASSOCIATION OF GRADUATES OF THE ANGLE SCHOOL OF ORTHODONTIA

THE Thirtieth Annual Meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held in New York City, May 8 at the American Museum of Natural History, Central Park West and 79th St., and May 9 at the Hotel Vanderbilt, Park Ave. and 34th St.

E. STANLEY BUTLER, *Secretary,*
55 Locust Ave.,
New Rochelle, N. Y.

UNIVERSITY OF MARYLAND DENTAL SCHOOL REUNION OF CLASS OF 1904

THE thirty-fifth reunion of the Class of 1904 of the Dental School of the University of Maryland will be held in Baltimore June 1-3 in conjunction with June Week festivities of the Baltimore College of Dental Surgery, Dental School of the University of Maryland. For further information, address

WALTER E. GREEN, *Chairman,*
Class of 1904,
2958 W. North Ave.,
Baltimore.

MARQUETTE UNIVERSITY DENTAL SCHOOL CLASS OF 1919

THE class of 1919 of Marquette University Dental School will celebrate the twentieth anniversary of its graduation during the Eighty-First Annual Session of the American Dental Association in Milwaukee, July 17-21.

ROBERT PHELAN, *Secretary,*
208 E. Wisconsin Ave.,
Milwaukee, Wis.

NORTHWESTERN UNIVERSITY DENTAL SCHOOL CLASS OF 1914

THE Class of 1914 of Northwestern University Dental School will celebrate the twenty-fifth anniversary of its graduation June 6-8 and will be the honored guests of the university during homecoming week.

MILTON CRUSE, *Chairman,*
1977 W. 111th St.,
Chicago, Ill.

OHIO COLLEGE OF DENTAL SURGERY CLASS OF 1919

THE graduates of the Class of 1919 of Ohio College of Dental Surgery will celebrate their twentieth reunion at the Netherlands Plaza Hotel, Cincinnati, June 12.

F. W. LONG, *Chairman,*
Publicity Committee,
First National Bank Bldg.,
Norwood, Ohio.

ALUMNI SOCIETY OF TEMPLE UNIVERSITY (PHILADELPHIA DENTAL COLLEGE)

THE seventy-sixth annual session of the Alumni Society of Temple University (Philadelphia Dental College) will take place June 14, with a dental forum as the main feature. The opening meeting, scheduled for 10 a.m., will follow registration at the school. Luncheon will be served. In the afternoon there will be an outing in conjunction with the General Alumni Society of Temple University at Melrose Country Club. In the evening, a banquet will be held in the Locust Room of the Penn Athletic Club.

DAVID K. WALDMAN, *Chairman,*
Publicity Committee,
5203 Chester Ave.,
Philadelphia, Pa.

ALUMNI ASSOCIATION, SCHOOL OF DENTISTRY, WESTERN RESERVE UNIVERSITY

THE annual clinic day and homecoming of the Alumni Association of the School of Dentistry, Western Reserve University will be held June 12, with clinics and lectures during the afternoon and dinner and entertainment in the evening.

L. E. COOKE, *Secretary.*

FORSYTH ALUMNI ASSOCIATION

THE annual meeting of the Forsyth Alumni Association will be held in Milwaukee during

the week beginning July 16, the exact time and place to be announced later.

ROBERT A. HARRIS, JR., *Chairman,*
Organization Committee.,
529 University Club Bldg.,
St. Louis, Mo.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A COMPETITIVE examination to select not more than twenty for appointment in the Dental Corps of the Navy will be held July 5 at the Naval Medical School, Washington, D. C., Naval Training Station, Great Lakes, Ill., and Naval Training Station, San Diego, Calif. A candidate for appointment in the Dental Corps must be a citizen of the United States and must be between 21 and 32 years of age at the time of appointment, a graduate of a standard dental college, of good moral character and of unquestionable professional repute. Credentials relative to character, citizenship, date of birth and education must be submitted and approved before an applicant can be authorized to appear for examination.

Senior students in dental colleges may submit applications to appear for the examination held next after their dates of graduation. They should submit with their applications and credentials a letter from the dean of their dental school stating that they are members of the senior class and, immediately after receiving their diplomas, a letter from the dean or registrar of the dental school stating that they have received the degree of doctor of dental surgery or doctor of dental medicine as the case may be.

A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

COURSES IN FULL DENTURE CONSTRUCTION

THE Prosthetic Department of New York University College of Dentistry announces two postgraduate courses in full denture construction: 1. A full-time course (Course A) daily from 8 a.m. to 1 p.m., beginning May 15 and ending May 20. 2. A part-time course (Course B) every Friday from 1 p.m. to 6 p.m., starting May 26 and ending June 30. For further information, communicate with the office of the dean, New York University, College of Dentistry, 209 E. 23rd St., New York City.

SUMMER COURSES, CHICAGO DENTAL SOCIETY STUDY CLUB

THE Study Club of the Chicago Dental Society announces that short intensive courses will be presented at the study club headquarters in Chicago the week of July 24 (following the American Dental Association meeting in Milwaukee). All dental subjects will be covered. If you are interested in taking a course or courses relative to any dental subject, communicate with the Chicago Dental Society Study Club, 30 N. Michigan Ave., Chicago, and information will be forwarded to you.

MILDRED FLECK, *Supervisor.*

POSTGRADUATE COURSES AT THE UNIVERSITY OF PENNSYLVANIA

THE School of Dentistry of the University of Pennsylvania offers two special postgraduate courses, as follows:

1. Four day general refresher course, including local and conduction anesthesia, radiography, bacteriology, full denture prosthesis, partial denture prosthesis, ceramics, gold inlays and periodontia. The course will be conducted by the faculty of the school, aided by well-known specialists in the fields concerned. Time: June 5-8. Fee: $10, payable with application.

2. Ten day course in oral surgery, exodontia and local and general anesthesia. The course will consist in part of lectures on the subjects mentioned, supplemented by lectures and by demonstrations in anatomy, bacteriology, pathology and roentgenology pertinent to the clinical subjects. Most of the time will be spent in clinical instruction at the Evans Institute and at various hospitals. Time: May 29-June 8. Fee: $75, $25 to be sent with application and $50 payable at the time of registration at the school.

Applicants should state their school and class and dental society affiliation. They are not necessarily restricted to the University of Pennsylvania graduates, but alumni will be given preference in case the numerical limits are exceeded. Applications for each course should be made to the dean, School of Dentistry, University of Pennsylvania, Evans Institute, 40 and Spruce Sts., Philadelphia, Pa.

FÉDÉRATION DENTAIRE INTERNATIONALE

THE Fédération Dentaire Internationale has accepted the invitation of the Swiss members to meet in Zurich, July 25-30, at the Hotel Bauer au Lac, Falstrasse. In accordance with the suggestion of the *Comité Georges Villain,* it was decided to unveil a bust of the late honorary president July 23 at the Dental School of Paris in the presence of the authorities and members of the dental profession from France and abroad. It is hoped that many members will be able to attend to give evidence of esteem for their late colleague. Because of the interest created last year by the joint meeting of the various commissions, another such meeting will be held, at which scientific papers will be presented and there will be an opportunity for free discussion.

W. H. G. LOGAN, *President,*
55 E. Washington St.,
Chicago, Ill.

CHARLES F. L. NORD, *General Secretary,*
1 Scheveningsche Weg,
The Hague,
Holland.

AMERICAN DENTAL SOCIETY OF EUROPE

THE next annual meeting of the American Dental Society of Europe will be held in Lausanne, Switzerland, August 7-9.

K. C. CAMPBELL, *Secretary,*
88 Portland Place,
London, W. 1.

ASSOCIATION OF INDUSTRIAL DENTISTS

THE progress in American industry has resulted in the provision of medical care for workers in plants and factories. Dentistry too has its place in the industries since many industrial diseases manifest themselves in the oral cavity. Correspondence is sought with dentists directly connected with industries maintaining their own dental departments, for the purpose of forming a group to foster interest in industrial dentistry. The forthcoming meeting of the American Dental Association in Milwaukee will afford an excellent opportunity for organization of such a group, which might well become invaluable to the progress of dentistry. Comments are invited.

S. E. AXELROD, *Director,*
Dental Department,
Amalgamated Clothing Workers of Chicago,
333 S. Ashland Blvd.,
Chicago, Ill.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING FEBRUARY 1939

February 7

No. 2,146,064, to MYRTLE B. GEORGE. Jacket for tooth mountings.

No. 2,146,290, to WILLIAM H. DOYLE. Tooth and mouth cleaning implement.

No. 2,146,375, to GEORGE A. LANDIS. Dental floss holder.

No. 2,146,455, to JACOB H. TEPPER. Toothbrush.

February 14

No. 2,147,103, to DALE L. MCKEE. Apparatus for investing and casting inlays.

No. 2,147,403, to HYMAN FREEDMAN. Dental bridgework and method of making same.

No. 2,147,616, to ELMER J. CHAPUT. Dental and medical hypodermic syringe.

February 21

No. 2,148,006, to NORMAN F. FOX. Device for applying dental floss.

No. D-113,427, to ROLAND A. MANNING. Design for an air compressor.

No. D-113,428, to ROLAND A. MANNING. Design for an air compressor.

No. D-113,432, to CARL A. NEWMAN. Design for an electrical dental implement.

February 28

No. 2,148,483, to EDNA OPAL LOVE and EMMETT J. MOLITOR. Tooth and gum massager and exerciser.

No. 2,148,692, to JAMES WELDON GUINN. Articulator.

No. 2,149,048, to HYMAN FREEDMAN. Artificial dental structure.